GE Healthcare

MAC™ 800
Resting ECG Analysis System

Software Version 1

Service Manual

2031504-159 Revision B

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NOTE

This manual applies to the MAC™ 800 software version 1. Due to continuing product innovation, specifications in this manual are subject to change without notice.

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1 Introduction

Manual Information

Revision History

The document's part number and revision appear at the bottom of each page. The revision identifies the document's update level. The revision history of this document is summarized in the following table.

Revision History, PN 2031504-159		
Revision	**Date**	**Comment**
A	1 July 2008	Initial release of document.
B	15 August 2008	Revised product specifications.

Manual Purpose

This manual supplies technical information for service representatives and technical personnel so they can maintain the equipment to the assembly level. Use it as a guide for maintenance and electrical repairs considered field repairable. Where necessary, the manual identifies additional sources of relevant information and/or technical assistance.

See the *MAC™ 800 Resting ECG Analysis System Operator's Manual* (2031504-182) for the instructions necessary to operate the equipment safely in accordance with its function and intended use.

Intended Audience

This manual is intended for persons who use, maintain, or troubleshoot this equipment.

Warnings, Cautions, and Notes

The terms danger, warning, and caution are used throughout this manual to identify hazards—sources of potential injury to a person—and to designate a degree or level or seriousness. Familiarize yourself with their definitions and significance.

Term	Definition
DANGER	Indicates an imminent hazard which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potential hazard or unsafe practice which, if not avoided, could result in death or serious injury.

Term	Definition
CAUTION	Indicates a potential hazard or unsafe practice which, if not avoided, could result in minor personal injury or product/property damage.
NOTE	Provides application tips or other useful information to ensure that you get the most from your equipment.

Equipment Information

Failure on the part of the responsible individual, hospital, or institution using this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

To ensure patient safety, use only parts and accessories manufactured or recommended by GE Healthcare.

Contact GE Healthcare for information before connecting any devices to this equipment that are not recommended in this manual.

If the installation of this equipment, in the USA, will use 240 V rather than 120 V, the source must be a center-tapped, 240 V, single-phase circuit.

Parts and accessories used must meet the requirements of the applicable IEC 60601 series safety standards, and/or the system configuration must meet the requirements of the IEC 60601-1-1 medical electrical systems standard.

The use of accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:

- use of the accessory in the patient vicinity; and
- evidence that the safety certification of the accessory has been performed in accordance to the appropriate IEC 60601-1 and/or IEC 60601-1-1 harmonized national standard.

Safety Messages

Additional safety messages may be found throughout this manual that provide appropriate safe operation information.

DANGER
FLAMMABLE HAZARD — Do not use in the presence of flammable anesthetics.

WARNING
USE APPROPRIATE POWER SOURCE — This is a Class I device with protective earth equipment. The mains plug must be connected to an appropriate power supply.

WARNING
PROPER GROUNDING — Operate the unit from its battery if the integrity of the protective earth conductor is in doubt.

CAUTION
AUTHORIZED SERVICE PERSONNEL ONLY — This equipment contains no user serviceable parts. Refer servicing to qualified service personnel.

CAUTION
USE ONLY ON ORDER BY PHYSICIAN — U.S. Federal law restricts this device to the sale by or on the order of a physician.

Responsibility of the Manufacturer

GE is responsible for the effects of safety, reliability, and performance only if:

- assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE,
- the electrical installation of the relevant room complies with the requirements of the appropriate regulations, and
- the equipment is used in accordance with the instructions for use.

Equipment Symbols

See the *MAC™ 800 Resting ECG Analysis System Operator's Manual* (2031504-182) for information about the symbols used on this product and its packaging.

Equipment Identification

Equipment can be identified via the product label and serial number attached to the equipment. The following topics describe the components of the product label and the serial number.

Product Label Format

GE product labels provide the product's part number, model description, serial number, manufacture date, and manufacture site. The following illustration shows the layout of a typical product label. A description of the label components follows the illustration.

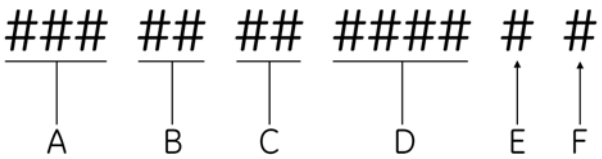
Product Label	
Item	**Description**
A	Date of manufacture in *YYYY-MM* format
B	Part number of product
C	Product code description
D	Serial number. For more information, see "Serial Number Format" on page 1-5.
E	Manufacture site

NOTE

Actual product label may differ from this representative example.

Serial Number Format

Every GE device is uniquely identified via serial number, which appears on the product label (see "Product Label Format" on page 1-5). The following illustration and table describe the serial number components.



A	The product code for MAC 800 systems is SDS.
B	Year Manufactured (00-99). Examples: ■ 07 = 2007 ■ 08 = 2008
C	Fiscal Week Manufactured
D	Production Sequence Number
E	Manufacturing Site
F	Miscellaneous Characteristic

Service Requirements

Refer equipment servicing to GE-authorized service personnel only. Any unauthorized attempt to repair equipment under warranty voids the warranty.

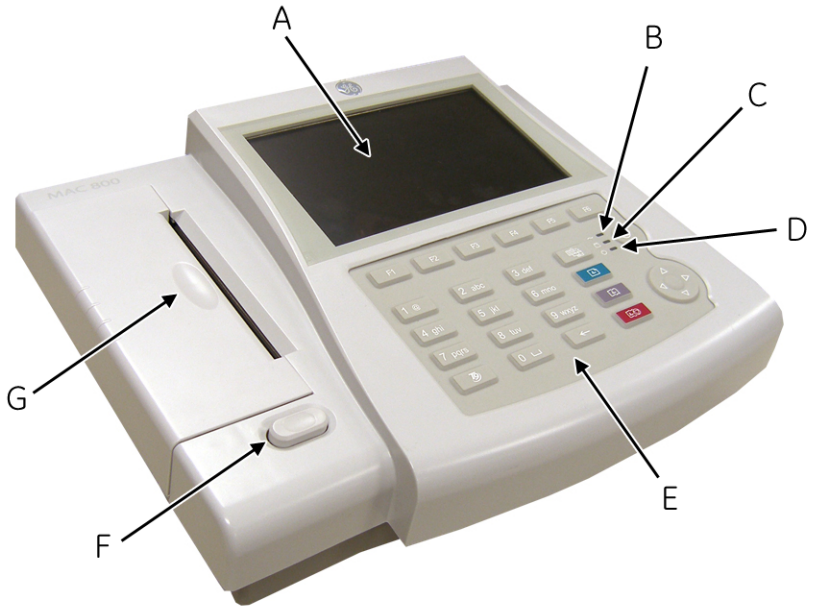
It is the user's responsibility to report the need for service to GE or to one of their authorized agents.

2 Equipment Overview

General Description

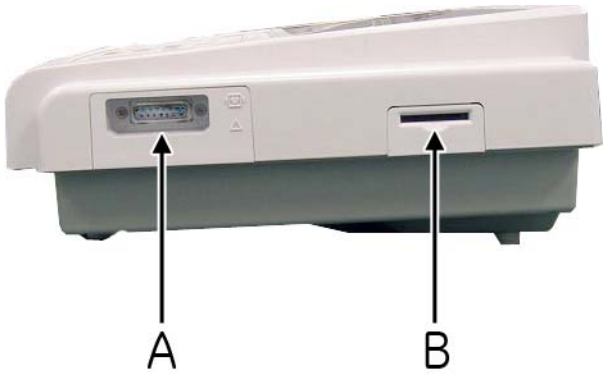
The MAC™ 800 is a 3- and 6-lead print, 12-channel display system with a 7 inch (17.78 cm) diagonal display, active patient cable, battery operation, and options for communication capabilities.

Front View



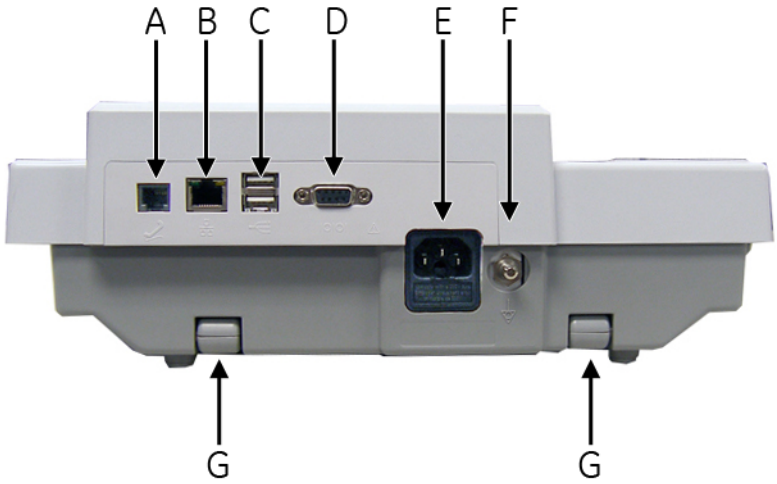
	Name	Description
A	Screen	Displays waveform and text data.
B	AC LED	Indicates when the unit is connected to AC power.
C	Battery LED	Indicates current battery status. ■ Solid indicates the battery is charging. ■ Flashing indicates the battery is low. ■ Off indicates the battery is fully-charged or is discharging but not at a low state.
D	Power LED	Indicates when the unit is powered on.
E	Keypad	Controls the system or enters data. See “Keypad” on page 2-4 for more information.
F	Writer Door Button	Opens printer door.
G	Writer	Prints reports.

Side View



	Name	Description
A	ECG signal input connector	Connects the patient cable to the device.
B	Secure digital (SD) card slot	Houses the secure digital (SD) card for external storage.

Back View

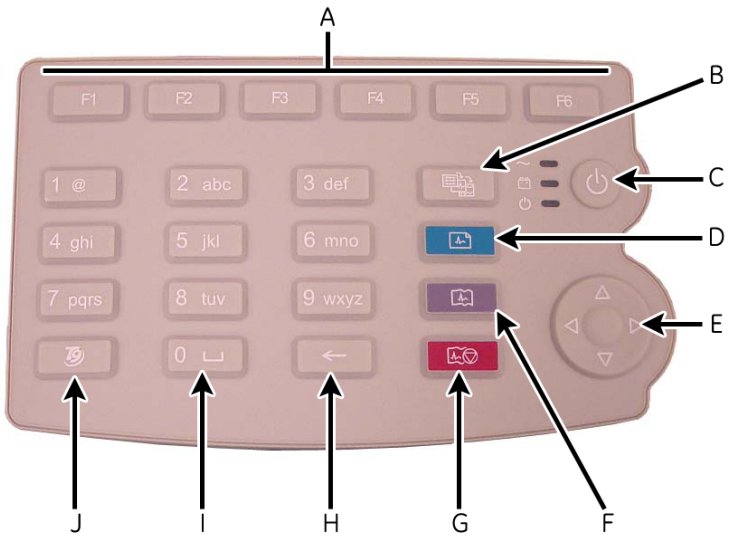


	Name	Description
A	Modem port	Standard RJ-11 jack for connecting the modem to a telephone line.

	Name	Description
B	LAN port	Standard RJ-45 jack for connecting the device to a LAN. LEDs on the port indicate status. ■ Solid green indicates a good connection. ■ Flashing amber indicates network traffic.
C	USB port	Universal Serial Bus port used to connect external devices, such as the optional barcode reader.
D	COMM port	Serial port for data communication. Use a serial cable to connect the unit to a CASE/Cardiosoft or MUSE system.
E	Main AC power connector	Connects the unit to an AC power outlet.
F	Equipotential grounding lug	Grounded connector for attaching non-grounded peripheral devices to ensure equipotentiality.
G	Carry handle	Retractable handle for carrying the unit.

Keypad

The English keypad is shown in the following illustration.

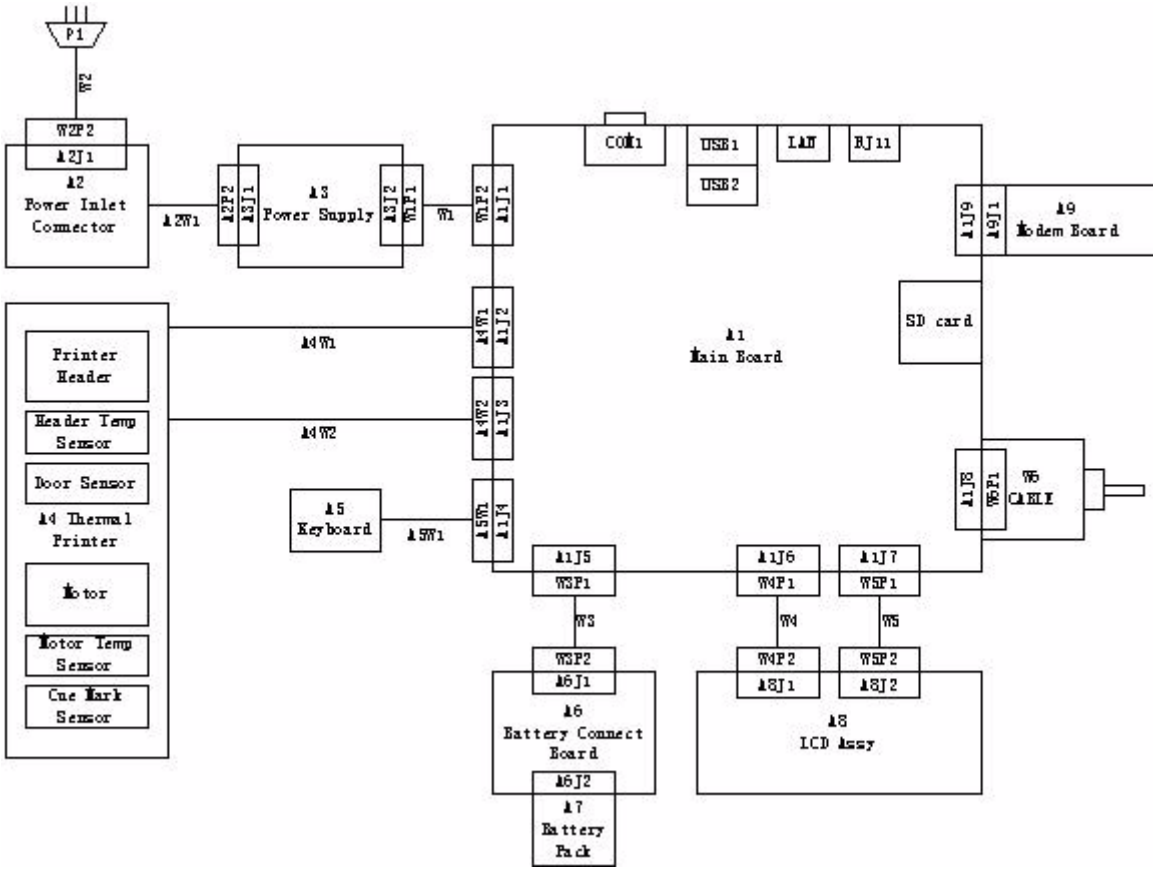


	Name	Description
A	Function Keys (F1 through F6)	Selects menu options on the screen.
B	Leads key	Changes the leads when the screen is being used to display waveforms.
C	Power Button	Turns the unit on and off.

	Name	Description
D	ECG key	Acquires a resting ECG and prints a 10-second report in *Arrhythmia* mode.
E	Trimpad	The arrows move the cursor left, right, up, or down. The center button moves the focus within a window or selects the currently active item.
F	Rhythm key	Prints a continuous, real-time rhythm ECG strip. Press the Stop key to stop the rhythm strip from printing.
G	Stop key	Stops the writer from printing.
H	Backspace Key	Deletes characters.
I	Space Key	Adds a space between typed characters.
J	T9 key	Switches between different input methods. For more information on using the T9 key, refer to the *MAC™ 800 Operator's Manual*.

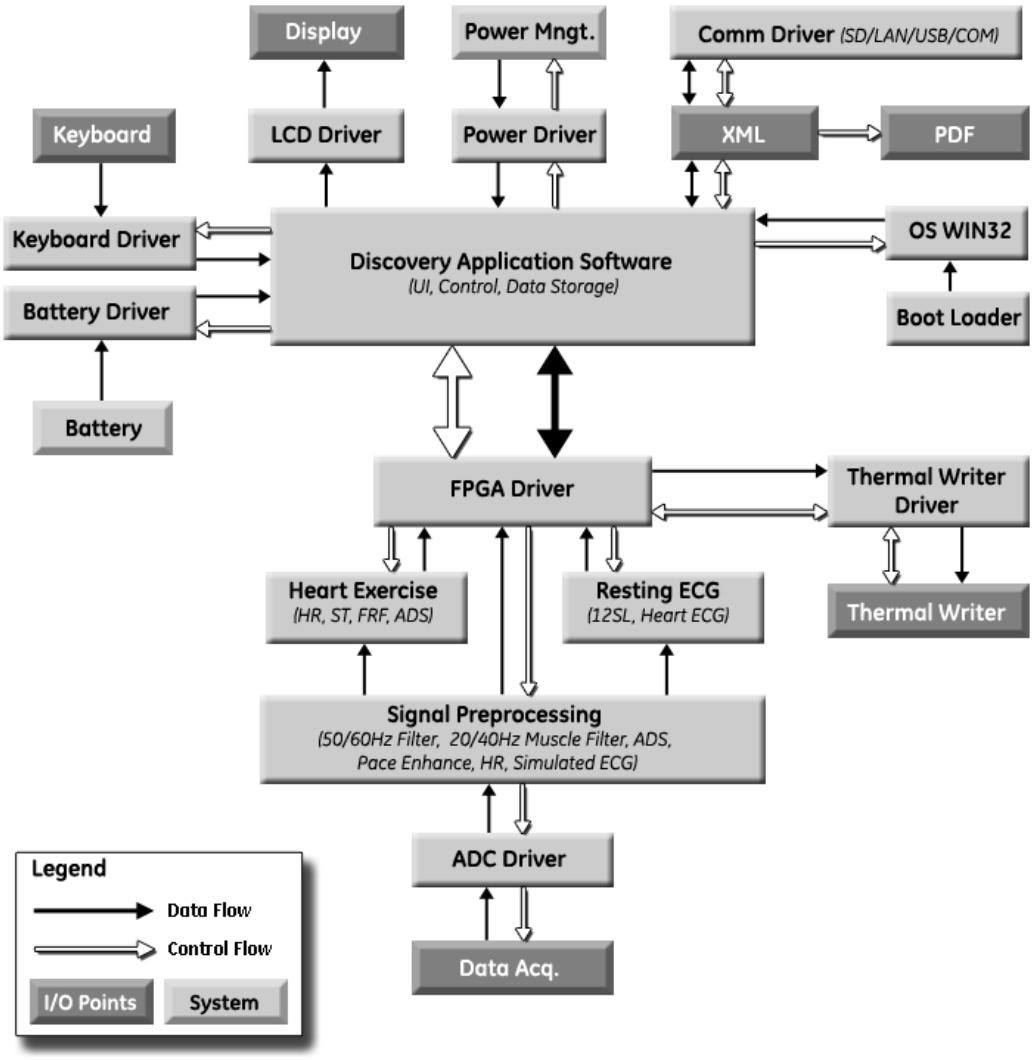
Detailed Description

Block Diagram



System Architecture

Overview



Hardware/firmware Architecture

The MAC 800 hardware and firmware subsystems include the following:

Hardware Subsystems	Firmware Subsystems
■ CPU core	■ CE BSP (Board-Support-Package)
■ Display	■ Printer API
■ Keyboard	■ Printer SW (Firmware for the Printer)
■ ECG Acquisition subsystem	■ Acquisition API
■ Thermal printer	■ Acquisition SW (Firmware for the Printer)
■ Power supply	
■ Housing	

Product Interfaces

The MAC 800 system offers the following interfaces for connecting to external devices for data communication, software updates, and the control of workload devices:

- RS232 port (1)

  Connects to external systems, like MUSE or Cardiosoft.
- RJ-45 port (1)

  Connects to networks via 100baseT ethernet connector via an external medical isolator.
- USB connector(2)

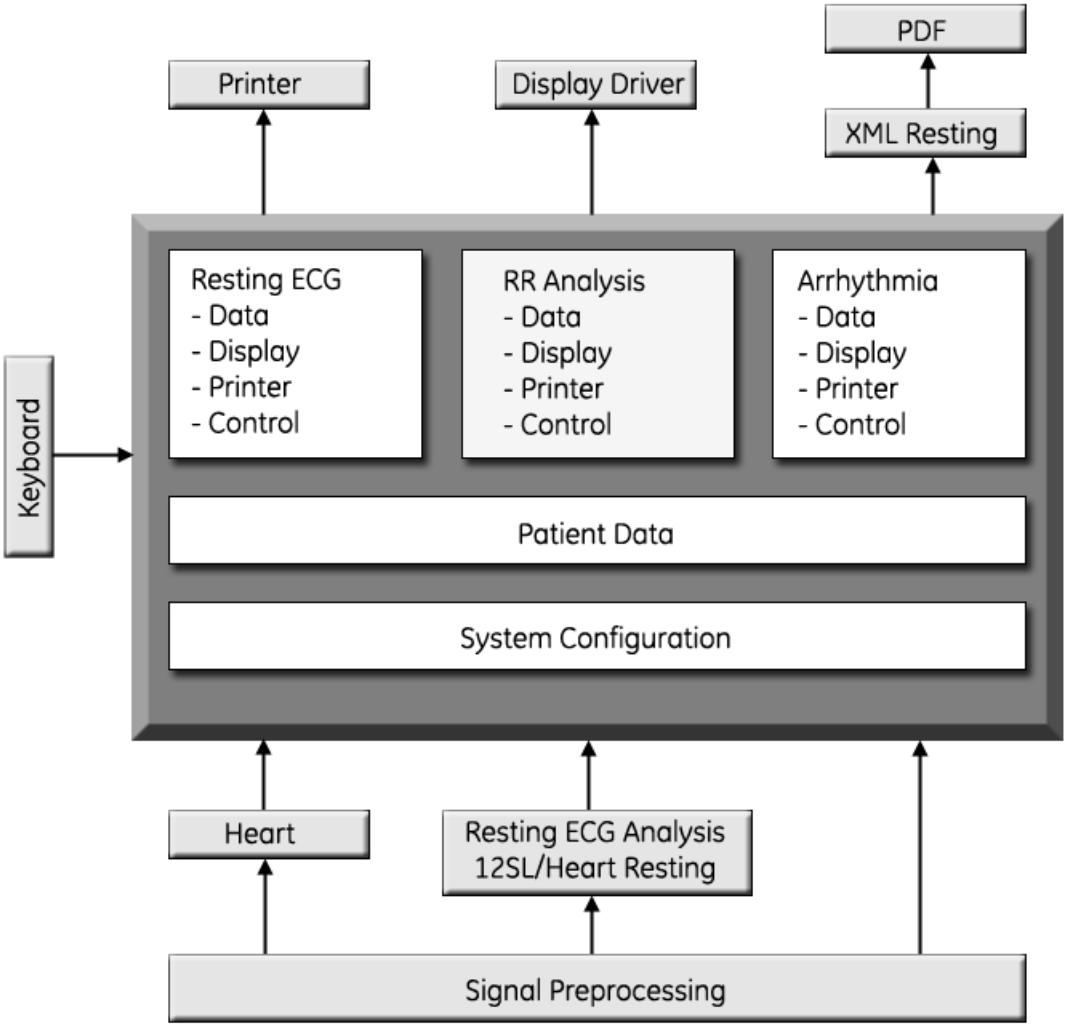
  Connects to USB-capable devices, such as optional barcode reader or external USB keyboard.
- Secure Digital (SD) Card slot

  Interfaces with a Secure Digital card, which is used to store ECGs, to flash the device with software updates, and to connect memory / future IO extensions.
- RJ-11 port (1)

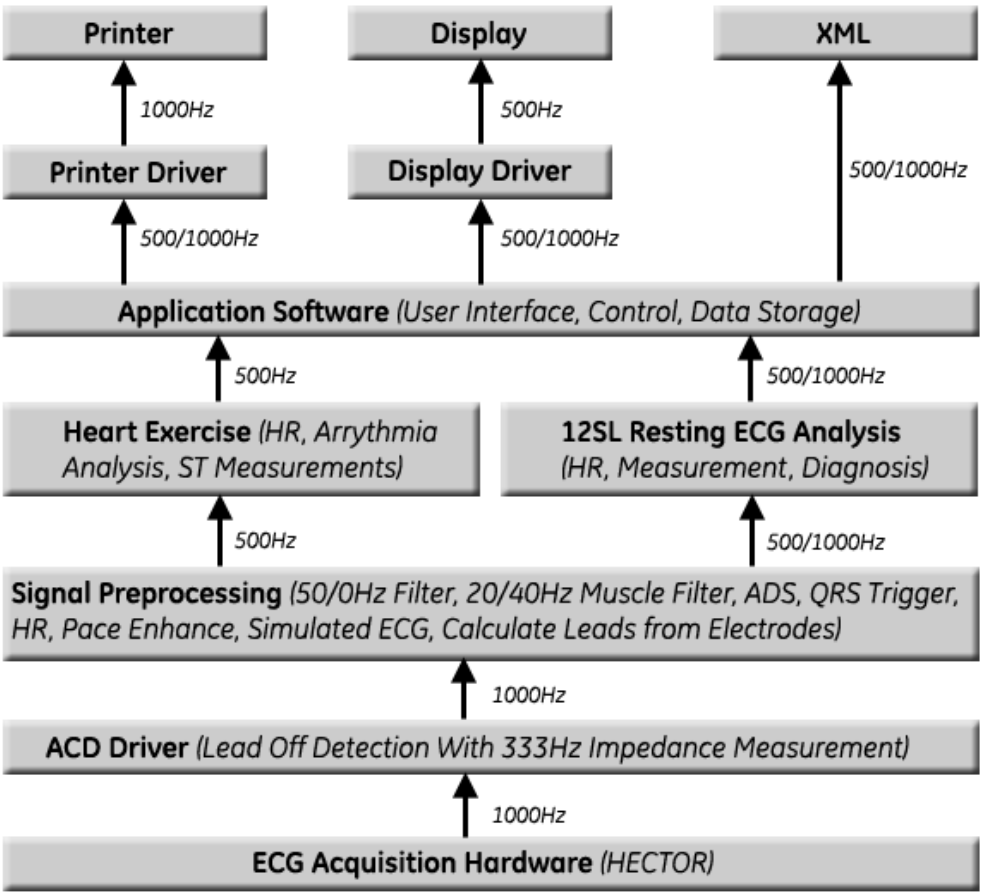
  Connects an internal medical grade Analog Modem (optional) to a phone line.

Software Architecture

Layered Structure of application software



ECG Data Flow With Sampling Rates



3 Troubleshooting

General Fault Isolation

Power-Up Self-Test

See the *MAC™ 800 Operator's Manual*, Chapter 2, "Equipment Overview: Getting Started" to verify operation.

On power-up, the system automatically runs an internal self-test. If all circuit tests pass, you will see the start-up screen.

The next screen that appears after the start-up screen depends on the *Power Up* mode selected in *System Configuration*. The *Resting ECG* mode is the default *Power Up* mode.

If the equipment is not working properly, ask the following questions.

- Is the unit turned on?
- Have there been any changes in the use, location, or environment of the equipment that could cause the failure?
- Has the equipment hardware or software been modified since last use?
- Is operator error the cause of the problem?

  Try to repeat the scenario exactly and compare that to the proper operation of the equipment described in the manual.
- Is the battery installed?
- When connected to the AC wall outlet, does the green AC power light glow?

Poor Quality ECGs

Poor quality ECGs can be caused by factors in the environment, inadequate patient preparation, hardware failures related to the acquisition module, lead wires, cables, or problems in the unit.

Visual Inspection

A thorough visual inspection of the equipment can save time. Small things—disconnected cables, foreign debris on circuit boards, missing hardware, loose components—can frequently cause symptoms and equipment failures that may appear to be unrelated and difficult to track.

NOTE

Take the time to make all the recommended visual checks before starting any detailed troubleshooting procedures

If the area is...	Look for...
I/O Connectors and Cables AC power cord	■ Fraying or other damage ■ Bent prongs or pins ■ Cracked housing ■ Loose screws in plugs
Interface cables	■ Excessive tension or wear ■ Loose connection ■ Strain reliefs out of place
Circuit boards	■ Moisture, dust, or debris (top and bottom) ■ Loose or missing components ■ Burn damage or smell of over-heated components ■ Socketed components not firmly seated ■ PCB not seated properly in edge connectors ■ Solder problems: cracks, splashes on board, incomplete feedthrough, prior modifications or repairs
Ground wires/Wiring	■ Loose wires or ground strap connections ■ Faulty wiring ■ Wires pinched or in vulnerable position
Fasteners	Loose or missing screws or other hardware, especially fasteners used as connections to ground planes on PCBs
Power source	■ Faulty wiring, especially AC outlet ■ Circuit not dedicated to system **NOTE** Power source problems can cause static discharge, reading problems, and discharge.
Keyboard	■ Cuts or cracks in the keyboard membrane ■ Unreadable labels
LCD display filter	Scratches or cracks in the display filter (transparent part of keyboard bezel) that impair viewing
Battery pack	■ Cracks, swells, or leaks in the battery casing ■ Dirt, scratches, or debris on contacts
SD card	■ Cracks ■ Dirt, scratches, or debris on contacts

Event Logging

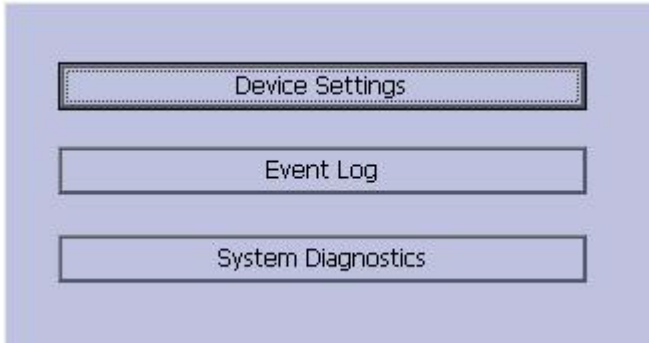
Setting Up Event Logging

The MAC 800 system can be set up to create an XML-format Event Log that contains system errors, warnings, and informational messages. Use the following procedure to configure the level of severity of messages written to the Event Log.

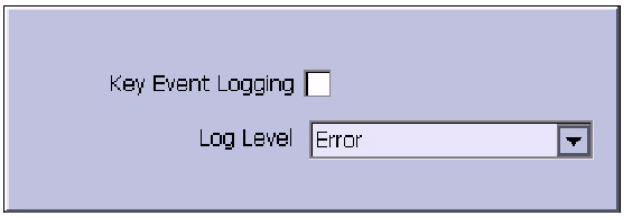
1. Power on the MAC 800 system by pressing the **Power** button.
2. From the *Main Menu*, press **F4** to select *System Configuration*.
3. Press **F6** (*More*) > **F6** (*More*) > **F5** (*Service Setup*).

   The following window prompts you to enter the Service password.

4. Type **7763** and press **F6** to select *OK* to open the Service Setup menu.



5. Move the focus to the *Event Log* button and press the **Enter** key.



6. Do one of the following:
   - To enable event logging, check the *Key Event Logging* check box.
   - To disable event logging, clear the *Key Event Logging* check box.

7. Select a level of severity to log from the *Log Level* list:
   - Select *None* to log nothing to the *Event Log*.
   - Select *Error* to log only errors to the *Event Log*.
   - Select *Warning* to log errors and warnings to the *Event Log*.
   - Select *Information* to log errors, warnings, and information messages to the *Event Log*.

8. Press **F6** to select *Save*.

Exporting the Event Log

1. Repeat step 1 through step 5 in "Setting Up Event Logging" on page 3-4.
2. Insert an SD card (gold contacts down) into the SD card slot as shown in the following illustration.

3. Press **F1** to select *Export Log Files*.

   The current *Event Log* file, *log_0.log*, is copied to a log directory on the SD card.

NOTE

To access the log file, insert the SD card into an SD card reader connected to a computer with a Windows operating system and open the log file with a text editor like Notepad or WordPad. If the *Event Log* is requested by GE Service for troubleshooting an issue, the file can be sent as an email attachment.

Performing Diagnostic Tests

Diagnostic tests can be used to verify that the MAC™ 800 operates properly. The tests check the operation of the display screen, speaker, keyboard, thermal writer, battery, and communications. They are useful tools for troubleshooting problems and can be useful as a part of system checkout procedures.

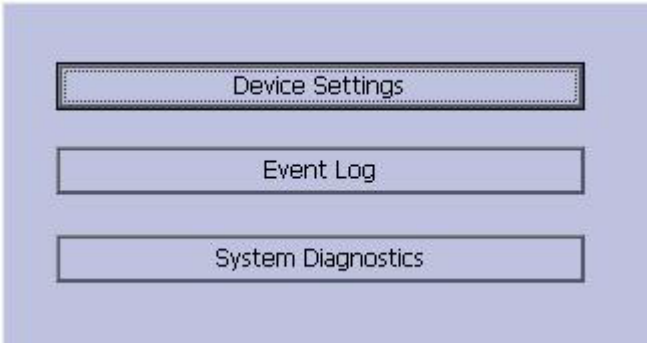
Accessing the System Diagnostics Function

The *System Diagnostics* menu can be used to perform functional diagnostic tests. Use the following procedure to access the *System Diagnostics* menu.

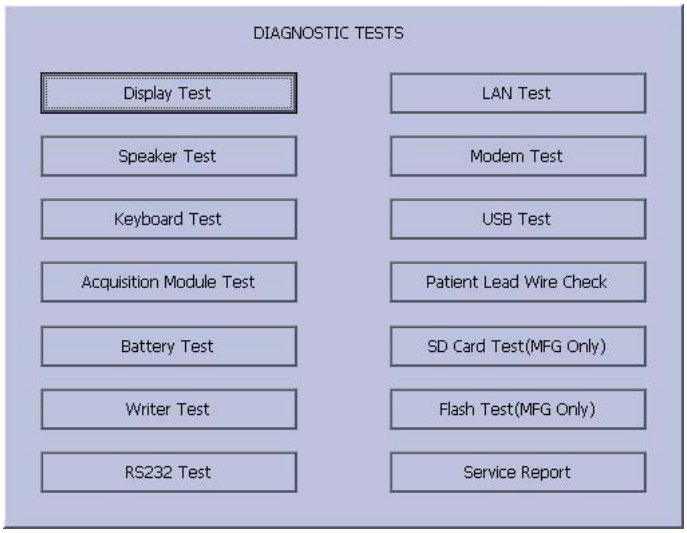
1. Power on the MAC 800 system by pressing the **Power** button.
2. From the *Main Menu*, press **F4** to select *System Configuration*.
3. Press **F6** (*More*) > **F6** (*More*) > **F5** (*Service Setup*).

   The following window prompts you to enter the Service password.

4. Type **7763** and press **F6** to select *OK* to open the Service Setup menu.



5. Move the focus to the *System Diagnostics* button and press the **Enter** key to open the *Diagnostic Tests* window.



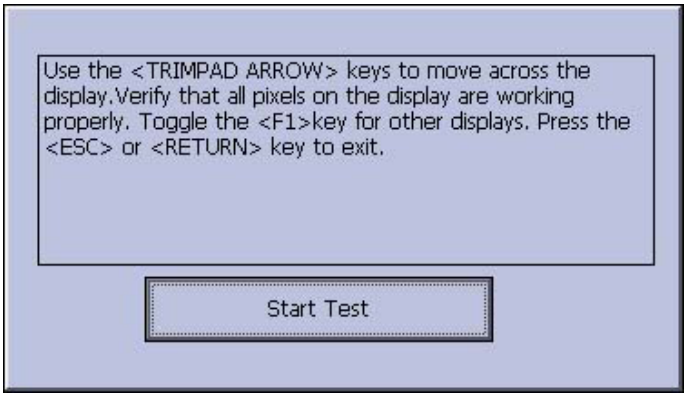
The following sections describe how to perform the specific diagnostic tests. Proceed to the appropriate section for the test you need to perform.

Display Test

The *Display Test* can be used to determine if the display pixels are working properly.

1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.
2. Select the *Display Test* button.

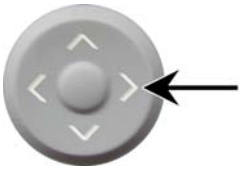
   The following window opens.



3. Select the *Start Test* button.

   The following window opens.

4. Press the right arrow key on the **Trimpad** repeatedly to move the color bars horizontally across the screen.



5. Verify that the color band pattern (red, green, blue, white) scrolls across the screen.

   Pass the test if the pattern is replicated without discoloration.

6. Press the **F1** key to switch to horizontal color bars.

7. Press the down arrow key on the **Trimpad** repeatedly.

8. Verify that the color band pattern (red, green, blue, white) scrolls down the screen.

   Pass the test if the pattern is replicated without discoloration.

9. Press the **F1** key to switch to cycle through the solid color pane (red, green, blue, white).

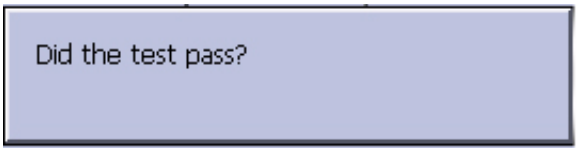
   For each pane, check for black pixels. Pass the test if no more than four black pixels are observed on any single color pane.

   NOTE

   A black pixel observed on one pane will probably be observed on every pane.

10. Press **Enter** when the test is complete.

    The following window opens.



11. Select Pass or Fail:

    - If the test passed, press **F4** to select *Yes*.
    - If the test failed, press **F5** to select *No*.

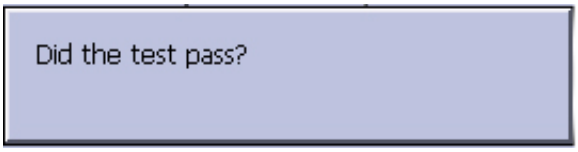
      Replace the display assembly as described in "Replacing the LCD Assembly" on page 4-11.

Speaker Test

The *Speaker Test* can be used to determine if the speaker is working properly.

1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.
2. Select the *Speaker Test* button.
3. Listen for a brief audible tone coming from the speaker.

   The following window opens.



4. Select Pass or Fail:

    - If you heard an audible tone, press **F4** to select *Yes*.
    - If you did not hear an audible tone, press **F5** to select *No*.

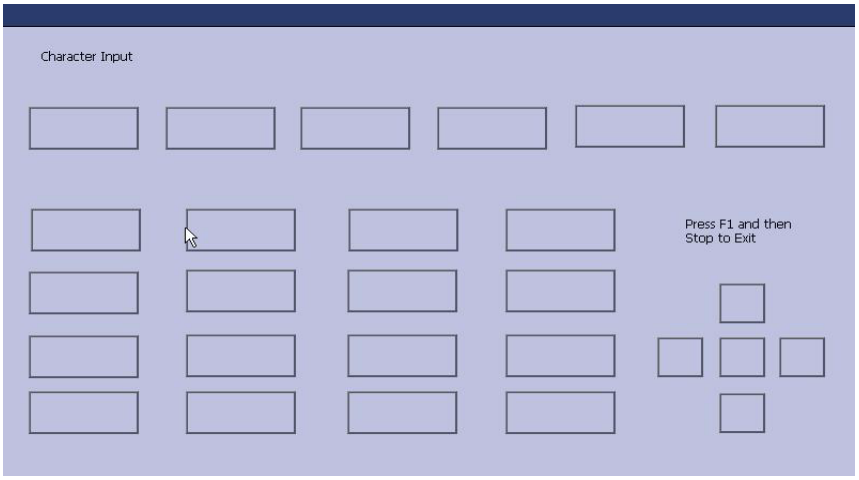
      Replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 4-15.

Keyboard Test

The *Keyboard Test* can be used to determine if the keyboard is working properly.

1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.
2. Select the *Keyboard Test* button.

   The following window opens.



3. Press each key on the keyboard and verify the value appears in the corresponding representation of that key on the screen.

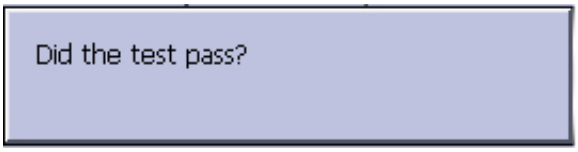
   A key passes the test if its value appears on the screen when the corresponding key is pressed.

4. To test for “sticky keys”, continue to press keys and verify that the screen representation of the key is refreshing with each subsequent key press.

   A key passes if the key on the screen refreshing with each repeated key press.

5. Press **F1 > Stop** when the test is complete.

   The following window opens.



6. Select Pass or Fail:

   - If every key passes the tests, press **F4** to select *Yes*.
   - If any key fails a test, press **F5** to select *No*.

     Replace the keyboard assembly as described in “Replacing the Keypad Assembly” on page 4-10.

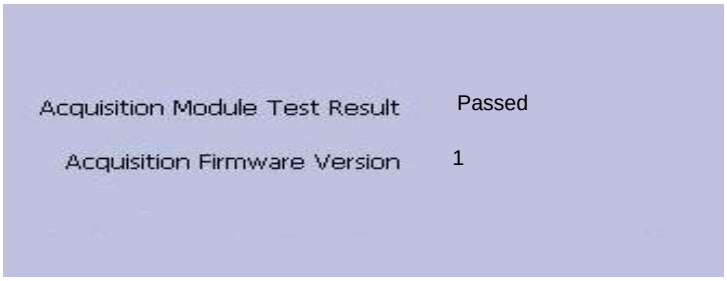
Acquisition Module Test

The *Acquisition Module* Test can be used to determine if the acquisition board is working properly.

1. Open the *Diagnostic Tests* window as described in “Accessing the System Diagnostics Function” on page 3-6.

2. Select the *Acquisition Module Test* button.

   The following window opens.



3. Note the test result and press **F6** to select *Cancel*.

   If the result of the *Acquisition Module Test Result* is *Failed*, replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 4-15.

Battery Test

The *Battery Test* can be used to determine the status of the Lithium-Ion battery.

1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.
2. Select the *Battery Test* button.

   The following window opens.

3. Note the battery status information and press **F6** to select *Cancel* and close the *Battery Status* window.

   If the *Battery Status* was *Failed*, replace the battery as described in "Replacing the Battery Assembly" on page 4-7.

Writer Test

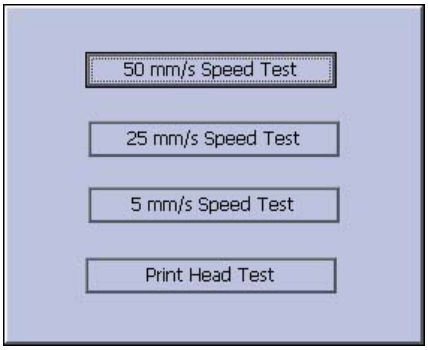
The *Writer Test* can be used to determine if the writer is working properly.

NOTE

Before performing the *Writer Test*, be sure that the correct thermal paper is properly loaded in the writer tray. Refer to the *MAC 800 Resting ECG Analysis System Operator's Manual* for instructions on loading paper.

1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.
2. Select the *Writer Test* button.

   The following window opens.

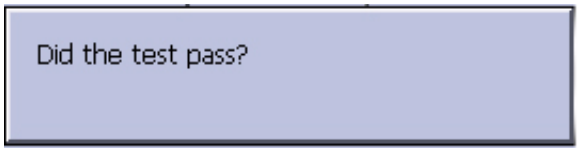


3. Perform the 50mm/s Speed Test.
   a. Select the *50mm/s Speed Test* button.

      The writer prints the 50 mm/s speed test report.

   b. When one page of the report has printed, press the **Stop** button.

      The following window opens.



   c. Examine the printed report.

      The 50mm/s speed test passes if one cycle of the square wave spans 50 mm on paper, measured from corner to corner of wave, with allowable tolerance of 1.0 mm. If that criteria is not met, the text fails.

   d. Do one of the following:

      - If the test passed, press **F4** to select *Yes*.
      - If the test failed, press **F5** to select *No*.

4. Repeat the previous step for the other speed tests.

   The pass-fail criteria for each of the remaining tests is as follows:

   - *25mm/s Speed Test* - If one cycle of the square wave spans 25 mm on paper, measured from corner to corner of wave, with allowable tolerance of 0.5 mm, the test passes. If this criteria is not met, the test fails.
   - *5mm/s Speed Test* - If one cycle of the square wave spans 5 mm on paper, measured from corner to corner of wave, with allowable tolerance of 0.25 mm, the test passes. If this criteria is not met, the test fails.

5. Perform the *Print Head Test*.

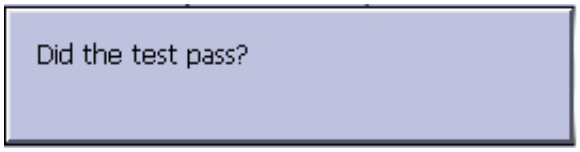
   a. Select the *Print Head Test* button.

      The writer prints a 1-page print head test report.

   b. Verify that there are no gaps in any of the lines printed.

      Up to 5 mm of blank paper is allowable at the top and bottom of the page.

      When the page is done printing, the following window opens.



   c. Do one of the following:

      - If there are no gaps in the lines on the printed report, press **F4** to select *Yes*.
      - If there are gaps in the lines on the printed report, press **F5** to select *No*.

        Replace the printer as described in "Replacing the Printer Assembly" on page 4-12.

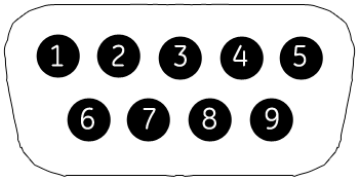
6. When all writer tests have been performed, press **F6** to select *Cancel* and close the window.

RS232 Test

The *RS232 Test* can be used to determine if the comm ports are working properly.

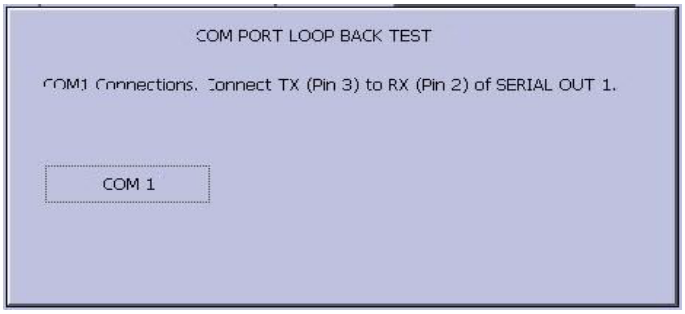
1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6

2. Use a paper clip to short pins 2 and 3 in the COM port.



3. Select the *RS232 Test* button.

   The following window opens.



4. Perform the *COM Port Loop Back* test on COM 1.

   a. With the focus on COM 1, press the **Enter** key.

      The results of the *COM Loop Back Test* are displayed.

   b. Note the results of the test.

      If either test failed, replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 4-15.

5. When the test is complete, press **F6** to *Cancel* and close the results window.

LAN Test

The *LAN Test* can be used to test network connectivity.

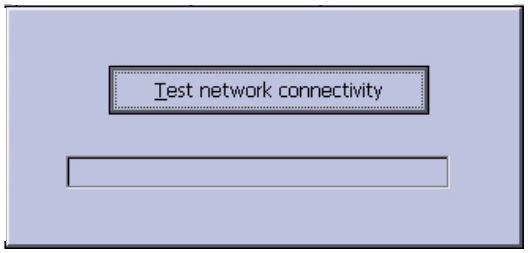
1. Connect the MAC 800 device to an active LAN.

   Ensure that the LAN is an active network. If you connect to an inactive network tap, the test result may be a false negative.

2. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.

3. Select the *LAN Test* button.

   The following window opens.



4. Press the **Enter** key to select the *Test Network Connectivity* button.

   The *Checking connectivity. Please wait.* message is displayed. Then, the results of test are displayed.

   - If the *System Connected to Network* message is displayed in the window, the test passes.

- If the *Network Unavailable* message is displayed in the window and you are sure the device is connected to an active network, the test fails.

  Replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 4-15.

5. When the test is complete, press **F6** to *Cancel* and close the results window.

Modem Test

The *Modem Test* can be used to test the internal modem.

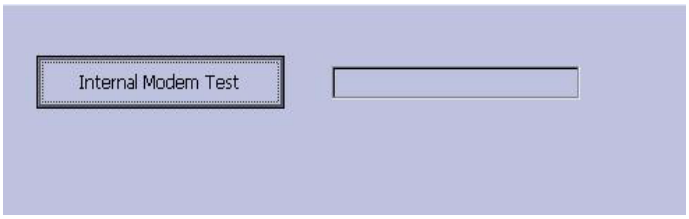
1. Connect the MAC 800 device to an active analog phone line.

   Ensure that the phone line is active. If you connect to an inactive phone line, the test result may be a false negative.

2. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.

3. Select the *Modem Test* button.

   The following window opens.



4. With the focus on the *Internal Modem Test* button press the **Enter** key.

   The *Test in Progress. Please wait* message is displayed. Then the results of the test are displayed.

   - If the *Passed* message is displayed in the window, the test passes.
   - If the *Failed* message is displayed in the window, the test fails.

     Replace the internal modem as described in "Replacing the Internal Modem (option)" on page 4-18.

USB Test

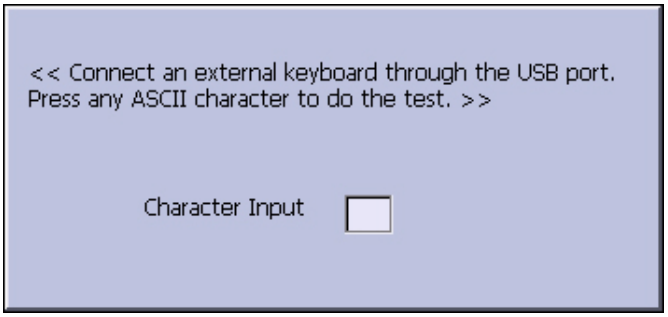
The *USB Test* can be used to test the USB port.

1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.

2. Connect a USB keyboard to the USB port of the MAC 800 back panel.

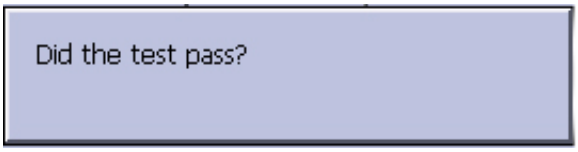
3. Select the *USB Test* button.

   The following window opens.



4. Press any key on the USB keyboard and verify pass or fail:
   - If the character that appears in the *Character Input* field matches the key you pressed, the test passed.
   - If the character does not match or no character appears in the *Character Input* field, the test fails.
5. When the test is complete, press **F6** to *Cancel*.

   The following window opens.



6. Do one of the following:
   - If the test passed, press **F4** to select *Yes*.
   - If the test failed, press **F5** to select *No*.

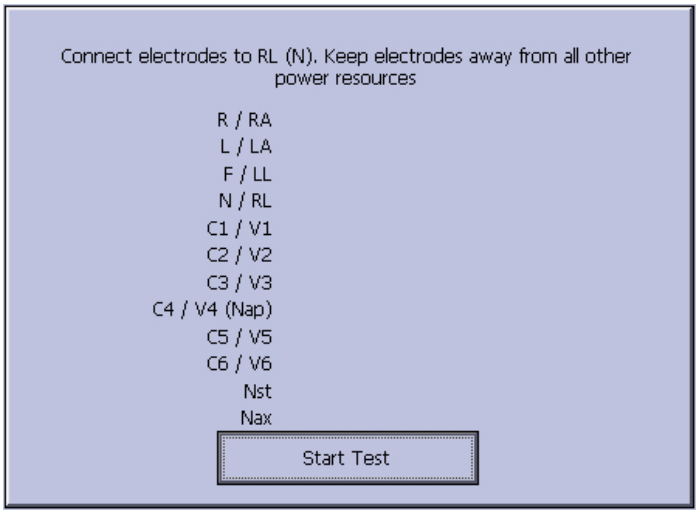
     Replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 4-15.

Patient Lead Wire Test

Test the patient leadwires as described in this section.

1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.
2. Connect a patient cable with lead wires to the MAC 800 patient cable connector.
3. Connect all leads to a patient simulator or shorting bar.
4. Select the *Patient Lead Wire Check* button.

   The window shown below opens.



5. Press the **Enter** key to select the *Start Test* button.

   For each lead wire, the test results are displayed.

   - If the *Connected* message is displayed, the lead wire passes the test.
   - If the *Disconnected* message is displayed, the lead wire fails the test.

6. Press **F6** (*Cancel*) when the test is complete.
7. Replace every lead wire that failed the test.
8. Repeat the test.

   If the lead wire still fails the test, replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 4-15.

Equipment Problems

ECG Data Noise

If the acquired ECG data displays unacceptable noise levels:

- When troubleshooting noise or signal quality, be sure the problem is not being caused by poor skin preparation, or placement and condition of electrodes.

  Careful skin preparation is the key to an interference-free ECG. Signal quality is indicated using Hookup Advisor. Hookup Advisor can be turned on or off in the ECG menu. Select *Main Menu* > *System Configuration* > *Resting ECG Setup* > *Page Down*.
- Check for defective or date-expired electrodes.
- Check for defective, broken, or disconnected leadwires.
- Run the *Acquisition Module Tests* in the *Diagnostic* menu and make sure all lead wires pass the noise test.

  Refer to "Acquisition Module Test" on page 3-10.

Error Codes

No action is necessary for isolated error occurrences. However if the unit is malfunctioning and any of the following error messages are repeating and unrecoverable, replace the FRUs in the order as listed.

Acquisition Error Codes

If you repeatedly receive any of the following acquisition error codes, replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 4-15.

Acquisition Error Codes	
Error Code	Cause
Acquisition Error -1	General acquisition error
Acquisition Error 3	Sequence number error in 100ms ECG Packet
Acquisition Error 9	Acquisition self test error

Printer Error Codes

If you repeatedly receive any of the following printer error codes, replace the printer assembly as described in "Replacing the Printer Assembly" on page 4-12.

Printer Error Codes	
Error Codes	Cause
Printer Internal Error 2	Printhead temperature is too hot or too cold to print
Printer Internal Error 3	Printer driver could not be opened
Printer Internal Error 4	Printer driver communication error
Printer Internal Error 5	Printer driver timeout error
Printer Internal Error 6	Printer driver miscellaneous error
Printer Internal Error 7	Undefined printer status was received

Frequently Asked Questions

Maintenance

NOTE
See the *MAC™ 800 Operator's Manual* for complete *System Configuration* information.

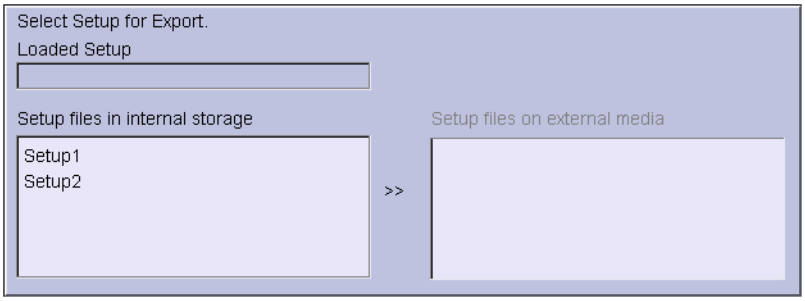
Save System Setups to SD Card

Q: How do I save changes I have made to the *System Configuration*?

A: Perform the following steps:

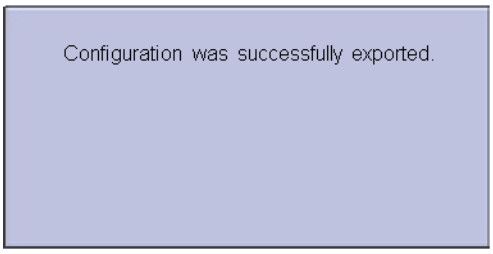
1. Insert the SD card into the SD card slot in right side as shown.

2. Push the SD card into the slot to seat it in place.
3. From the *Main Menu*, press **F4** to select *System Configuration*.
4. Press **F6** (*More*) > **F6** (*More*) > **F3** to select *Export Setup*.



5. Highlight the setup file you want to save to SD card from the list on left side of the window.
6. Press **F1** to select *Export*.

   The following window opens.



7. Press **F6** to select *OK*.
8. Eject the SD card by pushing it in once.

   Store it in a secure location.

Storing ECGs

Q: Why won't any of the ECGs I perform save to the SD card?

A: Check the following:

- Is the SD card fully inserted into the drive?
- Are you using 128 MB or greater SD cards?
- Is the SD card write-protected?
- Have you tried a new SD card?
- Is your system set up to automatically save records?
- If your system is not set up to automatically save records, did you press *Store*?

Cleaning

Q: Should I clean the MAC 800?

A: Clean the exterior surfaces of all the equipment and peripheral devices monthly, or more frequently if needed.

- Use a clean, soft cloth and a mild dish-washer detergent diluted in water.
- Wring the excess water from the cloth.

  Do NOT drip water or any liquid on the writer assembly, and avoid contact with open vents, plugs, and connectors.
- Dry the surfaces with a clean cloth or paper towel

Refer to the *MAC™ 800 Operator's Manual* for details on cleaning the MAC 800 system.

Battery Capacity

Q: What is the capacity of the battery?

A: We recommend that the MAC 800 be connected to AC power through a wall outlet whenever it is not in use. However, if operating the device without AC power, be aware that a fully-charged battery is capable of printing approximately 1000 single page reports or 2 hours of continuous operation (without printing).

MAC Address

Q: I need to provide the MAC address of the device to the network administrator to enable the LAN communication option. How do I obtain the MAC address?

A: Follow these steps to obtain the MAC address:

1. Open the *Diagnostic Tests* window as described in "Accessing the System Diagnostics Function" on page 3-6.
2. Move the focus to the *Service Report* button and press the **Enter** key to select.
3. Find the MAC address on the printed service report.

Calibration

Q: How do I calibrate the MAC 800 system?

A: When it becomes necessary, you can calibrate the MAC 800 system using the following method:

1. Using a standardizing waveform generator, produce a 1.00 ± 0.01 -mV pulse signal with a rise-time no greater than 5ms and a width no greater than 100ms.
2. Connect the pulse signal to all available channels and set the gain to 10 mm/mV.
3. Verify the display pulses have an amplitude within ± 5% of the amplitude obtained when the 1.00 ± 0.01 -mV signal is applied.
4. Repeat the test for all fixed gain settings to verify the standardization pulse correctly reflects the gain setting.

   NOTE

   The error must be less than ±5% of the expected value or 0.5mm, whichever is greater.

5. Verify that the standardization signal appears on all channels.

System Setup

Location Number

Q: When entering patient data, how do I get the *Location* field to automatically populate with the same number?

A: The *Location* number can be set in *Basic Setup* to save you from entering it for each test.

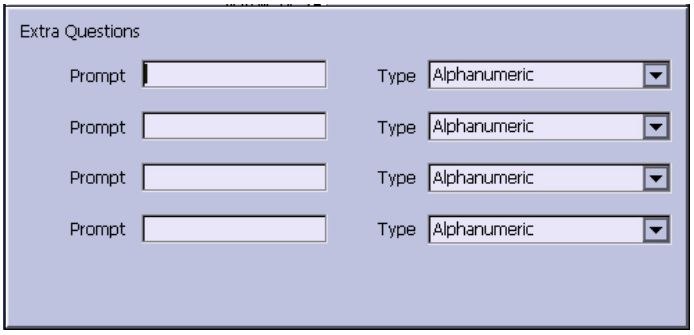
1. From the *Main Menu*, press **F4** to select *System Configuration*.
2. Press **F1** to select *Basic Setup*.
3. Move the focus to the *Location* field.
4. Type the desired *Location* number.
5. Press **F6** to select *Save*.
6. Press **F5** to select *Main Menu*.

Patient Questions

Q: How do I change which questions I see when I am entering the patient data?

A: The patient questions you see on the *Patient Data* window when starting a test were set up in *Patient Setup*.

1. From the *Main Menu*, press **F4** to select *System Configuration*.
2. Press **F6** (*More*) > **F4** (*Patient Setup*) > **F4** to select *Page Down*.
3. Move the focus to the *Extra Questions...* button and press **Enter** to open the *Extra Questions* window.



4. For each extra question you wish to ask in the *Patient Data* window, type the *Prompt* and select the type of question from the *Type* list (Alphanumeric, Numeric, Yes/No/Unknown).
5. Press **F6** to select *Save* in the *Extra Questions* window.
6. Press **F6** to select *Save* in the *Test Information Setup* window.
7. Return to the *Main Menu*.

Passwords

Q: The system was set up for *High Security Mode* and I forgot my password. How do I access the system?

A: Use the following steps:

1. Contact GE Tech Support and provide the serial number of the device you want to access.

   They will generate a temporary, device-specific name and password that can only be used for 24 hours.

2. Log into the system with the password provided by GE Tech Support.

3. Immediately after logging into the system, verify your MAC 800 user name and password. Record this information and store in a secure location for future reference.

Serial Number

Q: When the mainboard is replaced, how do I reenter the serial number to the new mainboard?

A: Use the following steps:

1. From the *Main Menu*, select **F4** (*System Configuration*) > **F6** (*More*) > **F6** (*More*) > **F5** (*Service*).

   The system prompts for the service password.

2. Type **7763** and press **Enter**.

   The service window opens.

3. Move the focus to *Device Settings* and press **Enter**.

   The *Device Settings* window opens.

4. Enter the unit's serial number and press **Enter**.

   The unit's serial number is located on the product label on the bottom of the device.

Clinical

Resting ECG Report Format

Q: How do I change the way an ECG looks (format) when it prints out?

A: Do the following.

1. From the *Main Menu*, press **F4** to select *System Configuration*.

2. Press **F2** to select *Resting ECG Setup*.

3. Press **F4** (*Page Down*) three times.

4. Select which type of ECG report you want to change from *10s ECG Report Format* list:
5. Select the number of copies you want from *Report Copies* list.
6. If you want the MAC 800 or 12SL Interpretation included on the ECG, check the *Print Interpretation* check box.
7. If you do not want the MAC 800 interpretation to print on the ECG, clear the *Print Interpretation* check box.
8. Press **F6** to save the setup.

Editing

Q: Can you edit the interpretation at the MAC 800, and then transmit the edited record to the MUSE system as an unconfirmed record?

A: MAC 800 does not support edit interpretation.

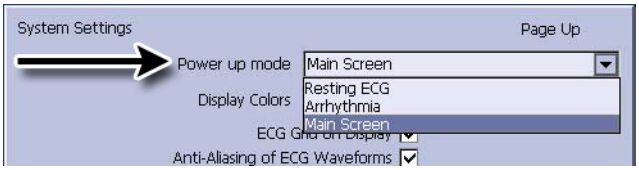
Navigating the User Interface

Q: How do I navigate from the startup screen to the *Main Menu*?

A: The MAC 800 system can be configured in a number of different ways. Some of these configuration choices determine the actions that need to be performed in order to proceed from the power up display to the *Main Menu*.

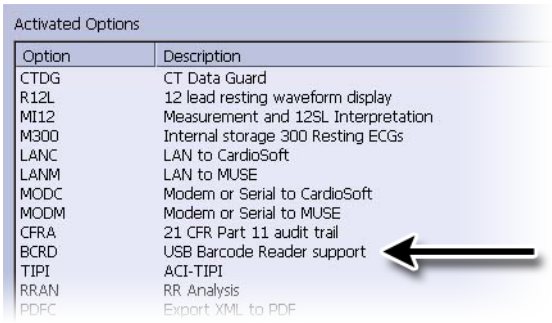
There are three configurations that determine the initial window that appears at power up and what actions the user will need to perform to navigate to the *Main Menu*.

Power Up mode currently selected in *Basic Setup*:



High Security mode enabled in *Basic Setup*:

USB Barcode Reader support option activated - yes or no.



The various steps in this section describe how to navigate from the power up screen to the *Main Menu* for the various system configurations. Use the steps that apply to your system configuration settings.

- If your system is configured to power up in the *Resting ECG* mode, go to "Resting ECG Power Up Mode" on page 3-25.
- If your system is configured to power up in the *Arrhythmia* mode, go to "Arrhythmia Mode Power Up Mode" on page 3-26.
- If your system is configured to power up in the *Main Screen* mode, go to "Main Screen Power Up Mode" on page 3-26.

Resting ECG Power Up Mode

These steps describe how to navigate to the *Main Menu* after powering on the MAC 800 system when *Resting ECG* is selected for *Power Up* mode in *Basic Setup*.

NOTE

To perform system setup functions, log in as a user who is assigned setup editing privileges.

1. If the *High Security Mode* is enabled, proceed with step a through step d when prompted for a *User ID* and *Password*; if the password prompt does not appear, go to step 2.
   a. Type your user ID in the *User ID* field.
   b. Press the **Enter** key or press the down arrow key on the **trimpad** to move the focus to the *Password* field.
   c. Type your password in the *Password* field.
   d. Press the **F5** key to select *Login*.
2. Press **F5** to select *Cancel*.
3. Press **F6** to select *More*.
4. Press **F5** to select *Main Menu*.

Arrhythmia Mode Power Up Mode

These steps describe how to navigate to the *Main Menu* after powering on the MAC 800 system when *Arrhythmia* is selected for *Power Up* mode in *Basic Setup*.

NOTE

To perform system setup functions, log in as a user who is assigned setup editing privileges.

1. If the *High Security Mode* is enabled, proceed with step a through step d when prompted for a *User ID* and *Password*; if the password prompt does not appear, go to step 2.

   a. Type your user ID in the *User ID* field.

   b. Press the **Enter** key or press the down arrow key on the **trimpad** to move the focus to the *Password* field.

   c. Type your password in the *Password* field.

   d. Press the **F5** key to select *Login*.

   If the barcode reader option is enabled, a window opens prompting you to scan the patient barcode.

   NOTE

   If the barcode prompt does not appear, go to step 3.

2. Press **F6** to select *Cancel*.
3. Press **F5** to select *Cancel*.
4. Press **F6** to select *More*.
5. Press **F5** to select *Main Menu*.

Main Screen Power Up Mode

These steps describe how to navigate to the *Main Menu* after powering on the MAC 800 system when *Main Screen* is selected for Power up mode in *Basic Setup*.

NOTE

To perform system setup functions, log in as a user who is assigned setup editing privileges.

1. If the *High Security Mode* is enabled, proceed with step a through step d when prompted for a *User ID* and *Password*; if the password prompt does not appear, go to step 2.

   a. Type your user ID in the *User ID* field.

   b. Press the **Enter** key or press the down arrow key on the **trimpad** to move the focus to the *Password* field.

   c. Type your password in the *Password* field.

   d. Press the **F5** key to select *Login*.

The Main Menu is displayed.

2. If the system is configured for *Main Screen Power up* mode and does not have the *High Security Mode* enabled, the *Main Menu* appears after powering up the system. No further keys need be pressed in order to display the *Main Menu*.

4 Maintenance

Introduction

Recommended Maintenance

Regular maintenance, irrespective of usage, is essential to ensure that the equipment will always be functional when required. See the *MAC 800 Resting ECG Analysis System Operator's Manual* for cleaning procedures. GE recommends that electrical safety checks be performed annually.

WARNING

MAINTENANCE RESPONSIBILITIES — Failure on the part of all responsible individuals, hospitals or institutions employing the use of this device to implement the recommended maintenance schedule may cause equipment failure and possible health hazards. The manufacturer does not, in any manner, assume the responsibility for performing the recommended maintenance schedule, unless an Equipment Maintenance Agreement exists.

The sole responsibility for performing the recommended maintenance schedule rests with the individuals, hospitals, or institutions utilizing the device.

Required Tools and Supplies

The following list identifies the tools required to perform the procedures described in this chapter.

- ECG simulator
- Phillips #1 screwdriver
- Hexagonal screw drivers
- Current leakage tester
- Anti-static wrist strap
- *MAC™ 800 Service Manual*
- *MAC™ 800 Operator's Manual*

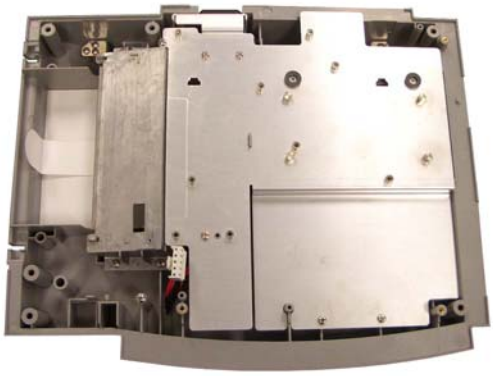
NOTE

Always use an anti-static wrist strap while opening the MAC 800 unit to avoid possible damage due to static electricity.

High-Level FRU Identification

Top Cover Assembly

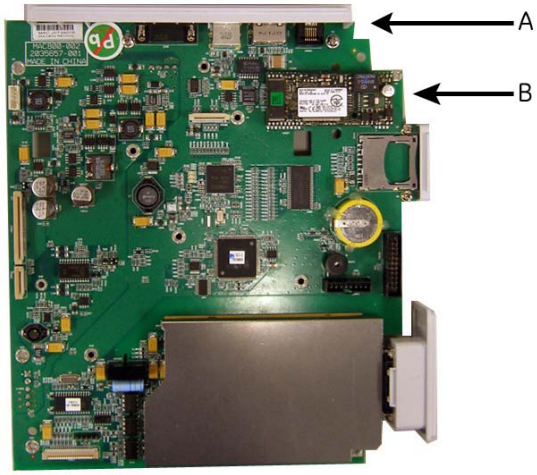
Bottom Assembly



Battery

LCD Assembly

Mainboard (A) and
Internal Modem (B, option)



Power Supply Assembly

Writer Assembly

Keypad Assembly

Barcode Reader (option)

Patient Cable

Serial Cable

FRU Replacement Procedures

Preparing System for FRU Replacement

Prior to performing any disassembly procedures, perform these steps.

NOTE
Take strict precautions against electrostatic discharge damage while replacing field replaceable units.

1. Power off the system.
2. Disconnect the unit from the AC wall outlet.
3. Disconnect the power cord from the back panel connector.
4. Disconnect the patient cable from the unit as described in “Replacing the Patient Cable” on page 4-5.
5. Remove the battery as described in “Replacing the Battery Assembly” on page 4-7.

Replacing the Patient Cable

1. Disconnect the system from AC power.
2. Disconnect the patient cable from the MAC 800 side panel connector as shown in the following illustration.

3. Connect the new patient cable to the side panel connector.
4. Perform the applicable checkout procedures.

   Refer to "Functional Checkout" on page 4-23.

Replacing Barcode Reader

1. Power off the system and disconnect from AC power.
2. Disconnect the barcode reader from the USB connector on the MAC 800 rear panel as shown in the following illustration.

3. If only the cable is to be replaced, disconnect the cable from the barcode reader using the following instructions.

   a. Insert an Allen wrench (or straightened paper clip) in the small hole in the base of the barcode reader.

b. While pushing the tool into the hole, pull the cable to remove it from the base of the barcode reader.

4. With a new cable, reverse the disassembly procedures to reassemble.

   Insert USB connector with (the USB symbol) facing down.

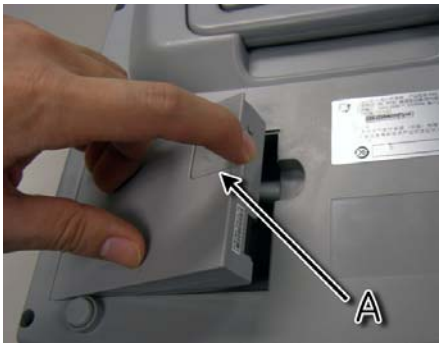
5. Configure the new barcode reader as described in the *MAC™ 800 Operator's Manual*.

6. Perform the applicable checkout procedures.

   Refer to "Functional Checkout" on page 4-23.

Replacing the Battery Assembly

1. Disconnect the system from AC power.
2. Turn the unit over.
3. Press the battery release tab (A) and raise the battery from its compartment to remove it.

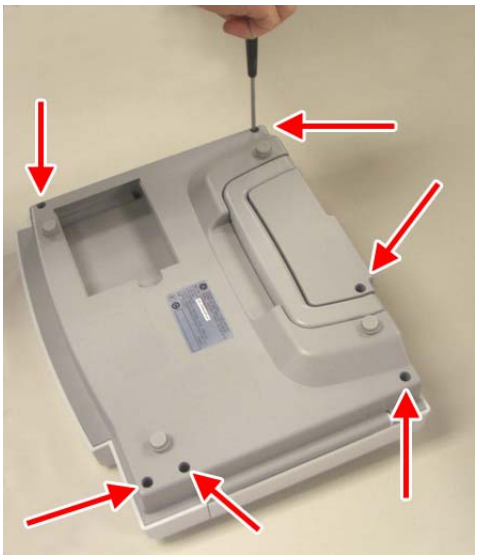


4. Insert the new battery by reversing the steps for removal.
5. Perform the applicable checkout procedures.

   Refer to "Functional Checkout" on page 4-23.

Replacing the Top Cover Assembly

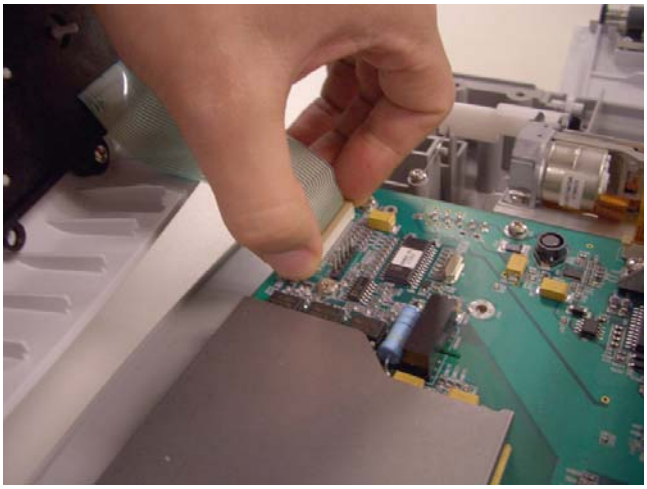
1. Disconnect the system from AC power.
2. Remove the battery assembly as described in “Replacing the Battery Assembly” on page 4-7
3. Remove the six screws from the bottom of the device.



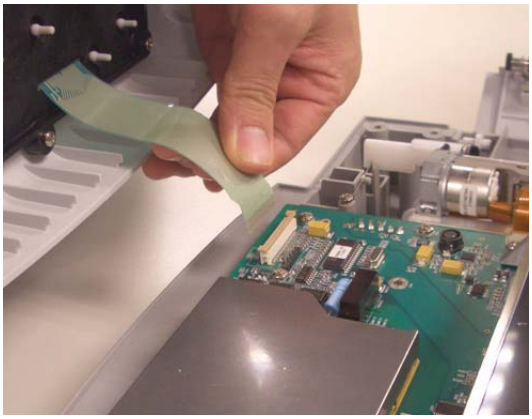
4. Turn the unit right side up.
5. Press the printer button.

6. Open the printer door.
7. Lift the top assembly approximately 1 inch at the back panel side.

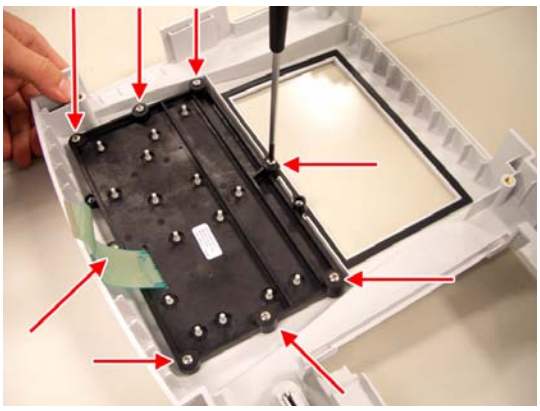
8. Pull up the lock-release tab on mainboard keypad connector.



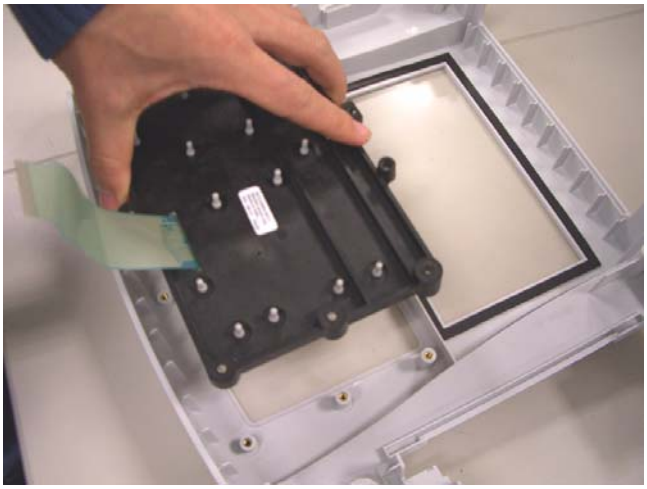
9. Disconnect the keypad cable as shown.



10. Remove the eight screws from the bottom of the top cover assembly.



11. Separate the keypad from the top cover assembly.



12. Reassemble a new top cover assembly by reversing the steps for removal.
13. Perform the applicable checkout procedures.

    Refer to “Functional Checkout” on page 4-23.

Replacing the Keypad Assembly

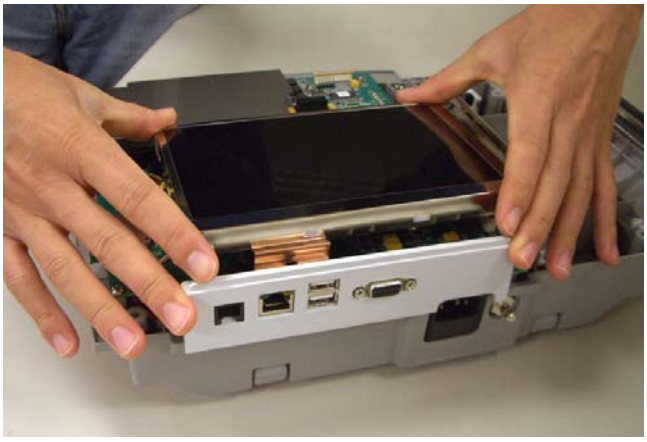
1. Perform step 1 to step 11 as described in “Replacing the Top Cover Assembly” on page 4-8.
2. Reassemble a new keypad assembly by reversing the steps for removal.
3. Perform the applicable checkout procedures.

    Refer to “Functional Checkout” on page 4-23.

Replacing the LCD Assembly

1. Disconnect the system from AC power.
2. Remove the battery assembly as described in “Replacing the Battery Assembly” on page 4-7.
3. Remove the top cover assembly as described in “Replacing the Top Cover Assembly” on page 4-8.
4. Remove the two screws that hold the LCD assembly in place.

5. Push the LCD assembly forward to away from the rear panel.



6. Disconnect the inverter cable from the mainboard.

7. Disconnect the LCD cable from the mainboard.

8. Lift the LCD ASSY out of the BOTTOM ASSY.
9. Reassemble a new LCD ASSY by reversing the steps for removal.
10. Perform the applicable checkout procedures.

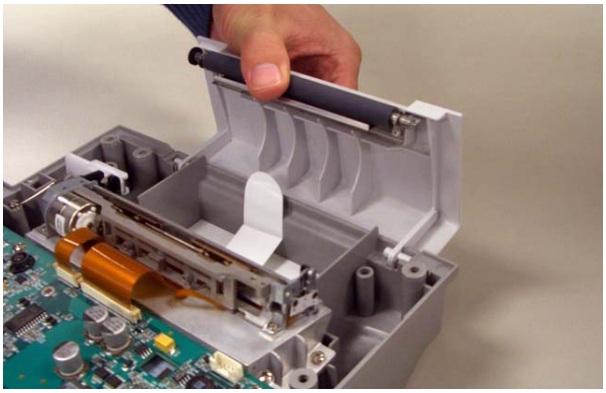
    Refer to “Functional Checkout” on page 4-23.

Replacing the Printer Assembly

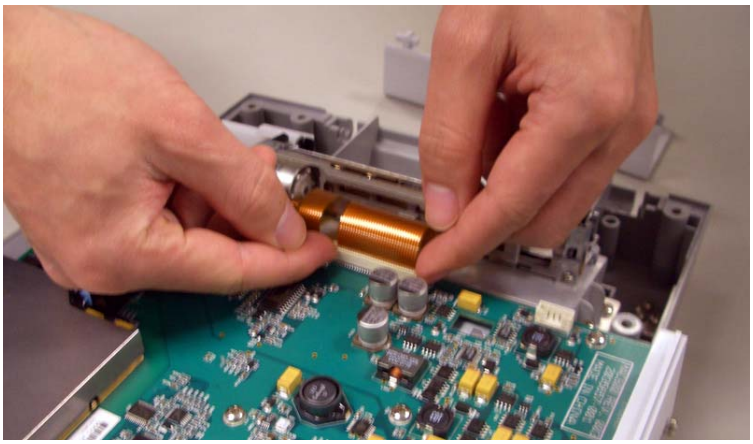
Removing the Printer Assembly

1. Disconnect the system from AC power.
2. Remove the battery assembly as described in “Replacing the Battery Assembly” on page 4-7.
3. Remove the top cover assembly as described in “Replacing the Top Cover Assembly” on page 4-8.
4. Remove the LCD Assembly as described in “Replacing the LCD Assembly” on page 4-11.

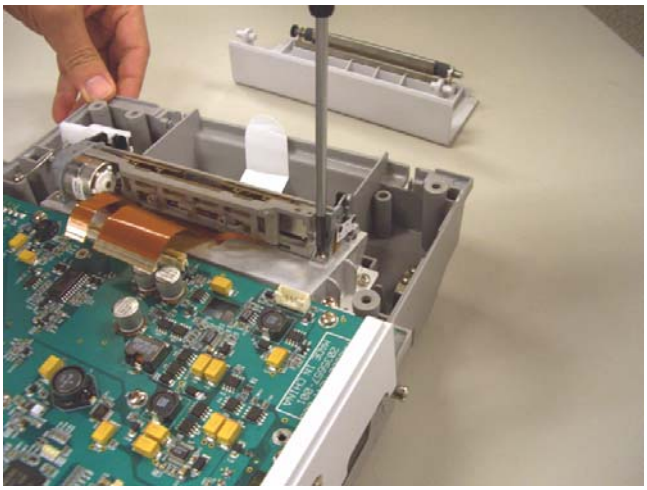
5. Remove the printer door from the bottom cover assembly as shown.



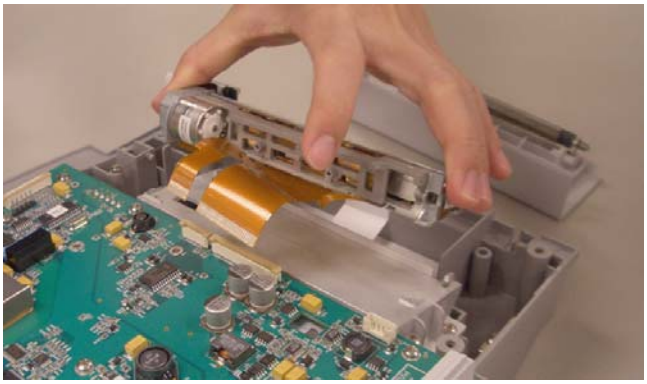
6. Disconnect the printer cable from the mainboard.



7. Remove the two screws from the printer mounting base as shown.

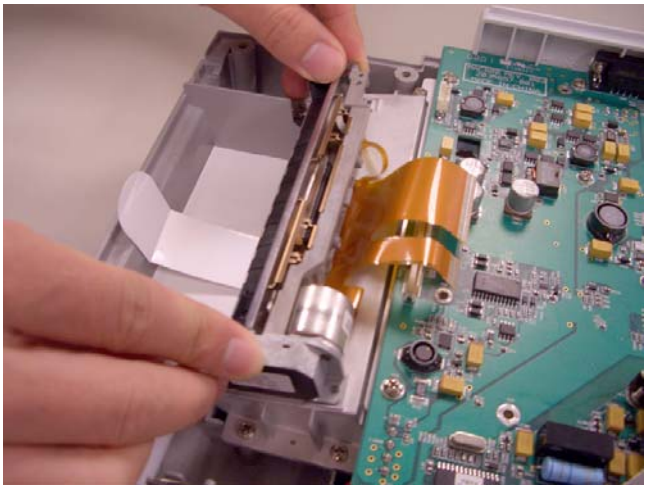


8. Remove the printer motor from the printer mounting base.



Reassembling the Printer Assembly

1. Replace a new printer motor on the bottom assembly as shown.



2. Replace the two mounting screws.
3. Reconnect the printer cable to the mainboard.
4. Replace the printer door.
5. Reassemble the LCD assembly.
6. Reassemble the top cover assembly.
7. Reassemble the battery assembly.
8. Perform the applicable checkout procedures.

   Refer to "Functional Checkout" on page 4-23.

Replacing the Mainboard Assembly

Processing ECGs in Internal Storage

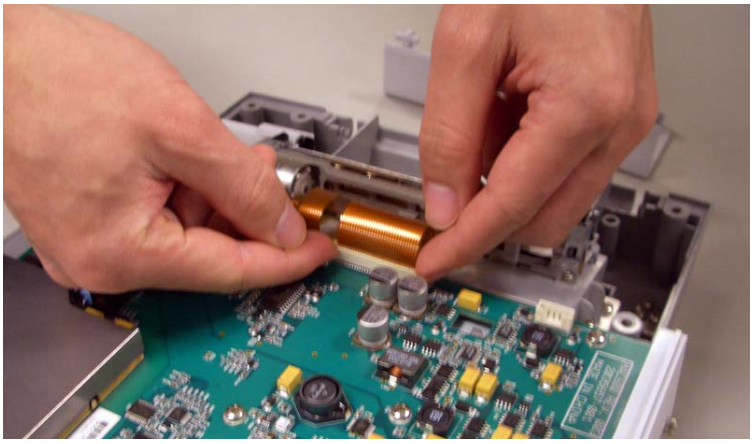
If the system has the internal storage option, process any ECGs remaining in storage by transmitting to your archival system and/or print them to ensure you have a printed record before proceeding with the mainboard replacement.

Saving System Configuration Settings

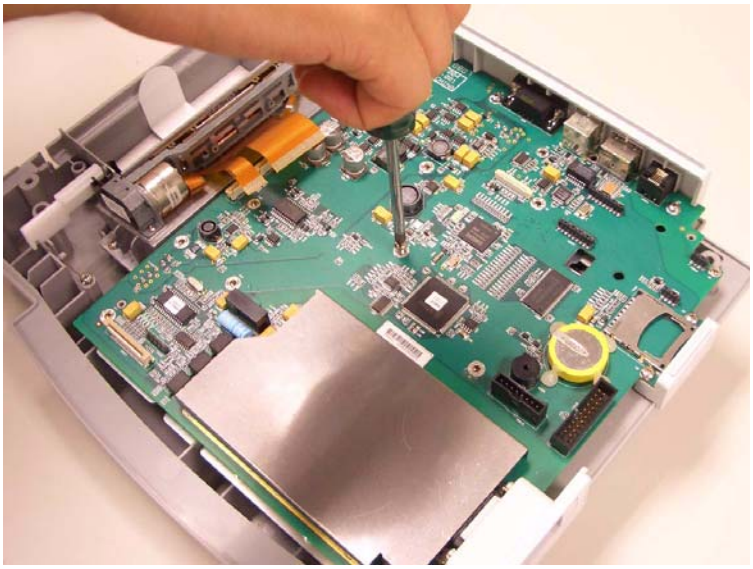
1. Store the *System Configuration* settings to an SD card.
   a. Insert SD card in the SD card slot.
   b. From the *Main Menu*, press **F4** to select *System Configuration*.
   c. Press **F6** (*More*) > **F6** (*More*) > **F3** to select *Export Setup*.
   d. Highlight the system setup file you want to export to the SD card.
   e. Press **F1** to select *Export*.
   f. When the *Configuration was successfully exported* message is displayed, press **F6** to select *OK*.
   g. Remove the SD card and store in a secure location.
2. Print the *System Setup Report* if you feel you may need it for additional reference after the FRU replacement procedure.
   a. From the *Main Menu*, press **F4** to select *System Configuration*.
   b. Press **F6** (*More*) > **F3** to select *Print Setup Report*.
   c. Move the focus to the *Complete Setup* button and press **Enter**.
   d. Save the printed setup report in a secure location. It can be used as a reference if *System Setup* needs to be restored manually.

Removing the Mainboard Assembly

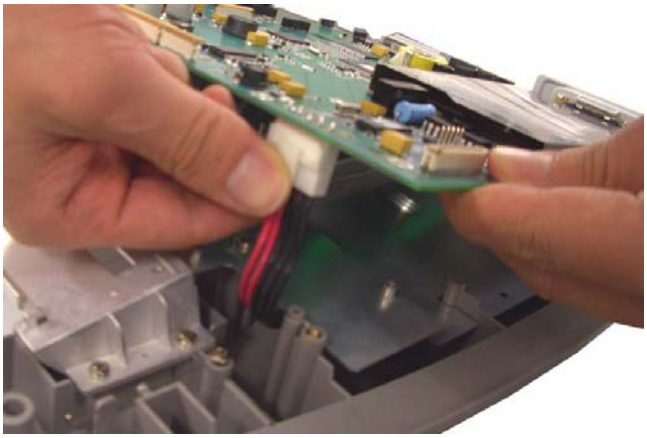
1. Disconnect the system from AC power.
2. Remove the battery assembly as described in "Replacing the Battery Assembly" on page 4-7.
3. Remove the top cover assembly as described in "Replacing the Top Cover Assembly" on page 4-8.
4. Remove the LCD assembly as described in "Replacing the LCD Assembly" on page 4-11.
5. Disconnect the printer cable from the mainboard.



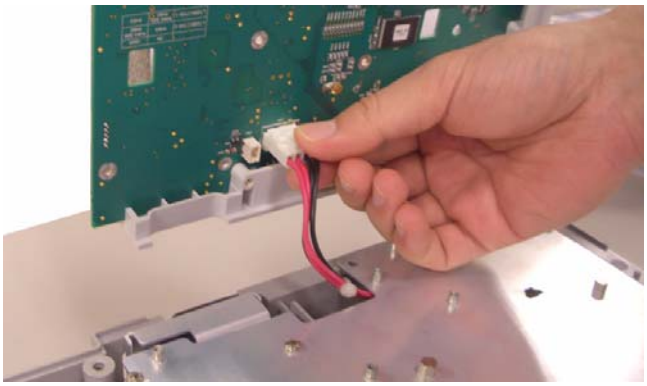
6. Remove the 10 screws that hold the mainboard in place.



7. Lift the mainboard assembly approximately 1.5 inch.
8. Disconnect the battery cable from the bottom side of mainboard.

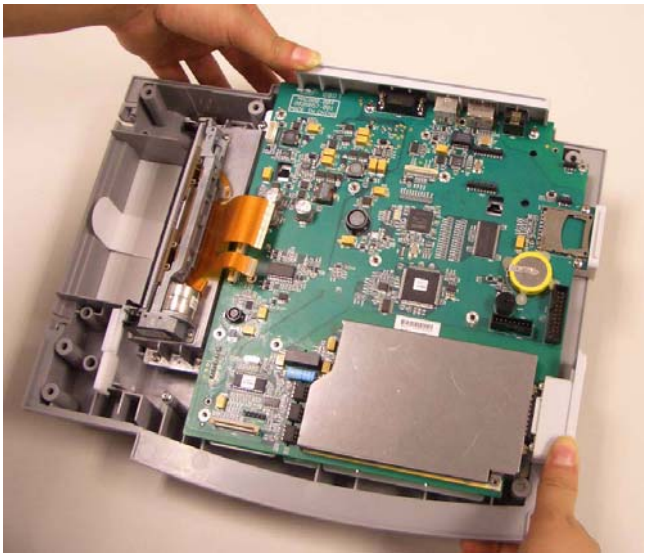


9. Disconnect the AD-DC cable from the bottom side of mainboard.



Reassembling the Mainboard Assembly

1. Reconnect the AC/DC cable to the bottom of the new mainboard.
2. Reconnect the battery cable to the bottom of the new mainboard.
3. Replace the new mainboard assembly on bottom cover assembly as shown.



4. Replace the 10 screws that were removed in step 6 on page 4-16.
5. Reconnect the printer cable to the new mainboard.
6. Reassemble the LCD assembly.
7. Reassemble the top cover assembly.
8. Reassemble the battery assembly.
9. Connect the power cord to AC power.
10. Install the software from the SD card that shipped with the mainboard and activate the options.

11. Restore system setups that were saved to the SD card.
12. Perform the applicable checkout procedures.

    Refer to “Functional Checkout” on page 4-23.

Replacing the Internal Modem (option)

1. Disconnect the system from AC power.
2. Remove the battery assembly as described in “Replacing the Battery Assembly” on page 4-7.
3. Remove the top cover assembly as described in “Replacing the Top Cover Assembly” on page 4-8.
4. Remove the lcd assembly as described in “Replacing the LCD Assembly” on page 4-11.
5. Remove the internal modem from its socket.
6. Reassemble the internal modem by reversing the steps for removal.

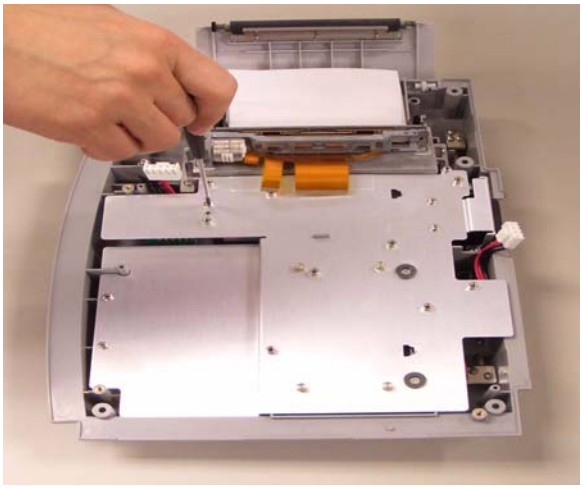
   Take care to align the contact pins with the sockets and align the hole with the plastic pin before pushing it into the sockets.
7. Perform the applicable checkout procedures.

   Refer to “Functional Checkout” on page 4-23.

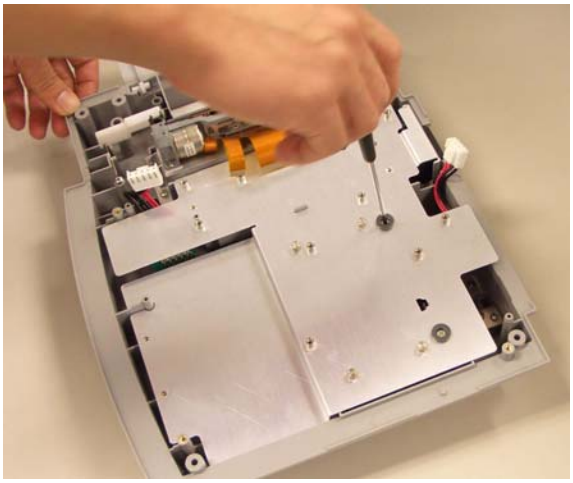
Replacing the Power Supply Assembly

Removing the Power Supply Assembly

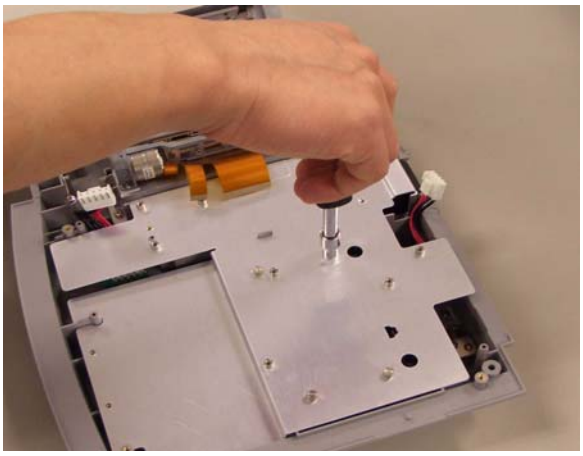
1. Disconnect the system from AC power.
2. Remove the battery assembly as described in “Replacing the Battery Assembly” on page 4-7.
3. Remove the top cover assembly as described in “Replacing the Top Cover Assembly” on page 4-8.
4. Remove the LCD assembly as described in “Replacing the LCD Assembly” on page 4-11.
5. Remove the mainboard assembly as described in “Removing the Mainboard Assembly” on page 4-15.
6. Remove the six M3X8 screws from the shield plate as shown in the following illustration.



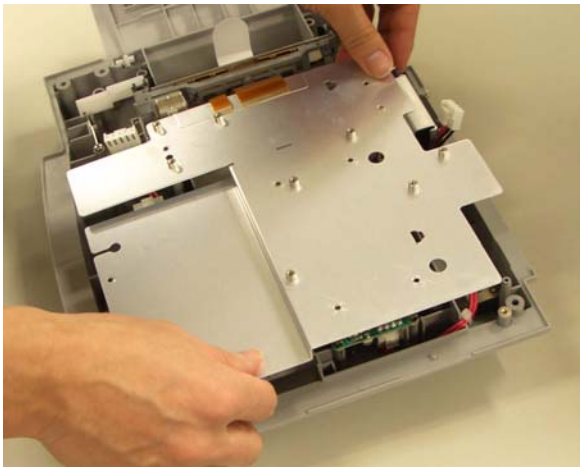
7. Remove the two M3X12 flat screws from the shield plate as shown in the following illustration.



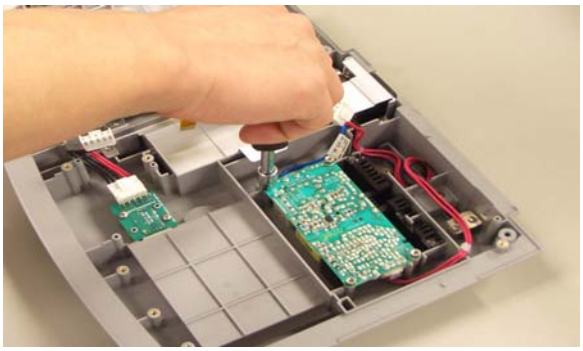
8. Remove the four hexagon screws from the shield plate as shown in the following illustration.



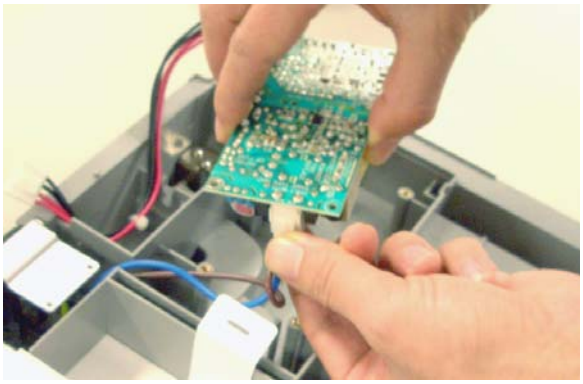
9. Remove the shield plate from the bottom cover assembly.



10. Remove the four hexagon screws of AC/DC as shown in the following illustration.

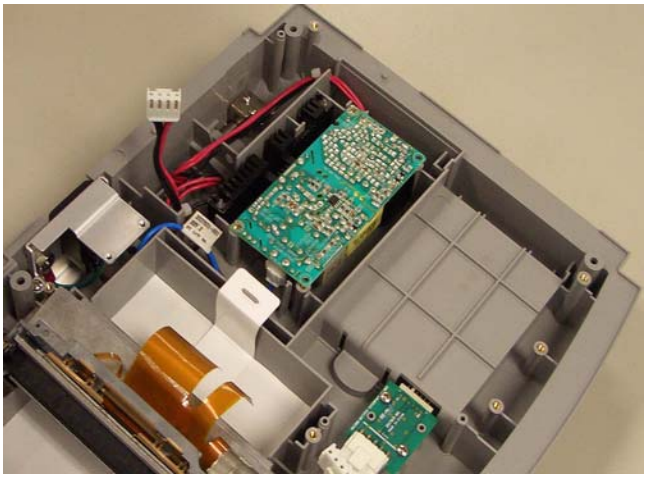


11. Lift the AC/DC and disconnect the AC inlet cable as shown in the following illustration.



Reassembling the Power Supply Assembly

1. Connect the AC inlet cable to the new AC/DC.
2. Place the new AC/DC in the bottom cover assembly.
3. Replace the four hexagon screws.
4. Route the AC/DC cable for mainboard as shown.



5. Replace the shield plate.
6. Replace the six M3X8 screws, two M3X12 flat screws, and four hexagon screws on the shield plate.
7. Reassemble the mainboard assembly.
8. Reassemble the printer assembly.
9. Reassemble the LCD assembly.
10. Reassemble the top cover assembly.
11. Reassemble the battery assembly.
12. Perform the applicable checkout procedures.

    Refer to “Functional Checkout” on page 4-23.

Replacing the Bottom Cover Assembly

1. Disconnect the system from AC power.
2. Remove the battery assembly as described in “Replacing the Battery Assembly” on page 4-7.
3. Remove the top cover assembly as described in “Replacing the Top Cover Assembly” on page 4-8.
4. Remove the LCD assembly as described in “Replacing the LCD Assembly” on page 4-11.

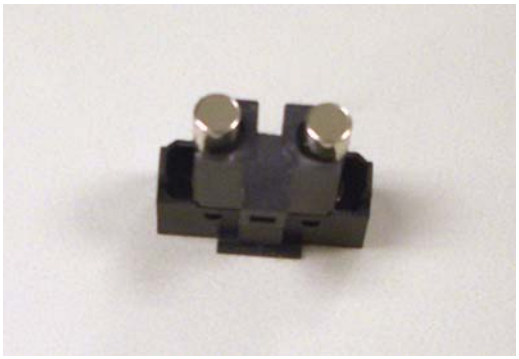
5. Remove the printer assembly as described in “Removing the Printer Assembly” on page 4-12.
6. Remove the mainboard assembly as described in “Removing the Mainboard Assembly” on page 4-15.
7. Remove the power supply assembly as described in “Replacing the Power Supply Assembly” on page 4-18.
8. Replace the new bottom cover assembly.
9. Reassemble the power supply assembly.
10. Reassemble the mainboard assembly.
11. Reassemble the printer assembly.
12. Reassemble the LCD assembly.
13. Reassemble the top cover assembly.
14. Reassemble the battery assembly.
15. Perform the applicable checkout procedures.

    Refer to “Functional Checkout” on page 4-23.

Replacing the Fuse

1. Disconnect the system from AC power.
2. Using a screw driver, take out the fuse holder from the AC inlet as shown in the following illustration.

3. Replace two new fuse in the fuse holder.



4. Reassemble the fuse holder into AC inlet.

Functional Checkout

The checkout procedures apply to all MAC 800 systems.

NOTE

The FRU checkout procedure for any listed FRU also applies to its internal PCBs and components.

Perform the applicable product or product configuration dependant procedures when an asterisk (*) is listed.

FRU replacement procedures are contained within this chapter of the manual.

Basic System FRU Repairs		
FRU Description	Visual Inspection	Functional Checkout Procedures
Patient Cable	1, 2, 7	1, 2, 3
Keypad Assembly	3, 6, 7	1, 2, 3, 7
Top Cover Assembly	6, 7	1, 2, 3, 14
LCD Assembly	3, 6, 7	1, 2, 3, 6
Printer Assembly	6, 7	1, 2, 3, 8
Mainboard Assembly	6, 7	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Power Supply Assembly	6, 7	1, 2, 3
Bottom Cover Assembly	6, 7	1, 2, 3
Battery Assembly	5	1, 2, 3, 11
AC Power Cord	4	1, 2, 3
Non Listed FRUs	6, 7	1, 2, 3, *14[1]

[1] When AC Power Mains disturbed.

Optional System FRU Repairs		
FRU Description	Visual Inspection	Functional Checkout Procedures
Internal Modem	6, 7	1, 2, 3, 5, 13
Barcode Reader	6, 7	1, 2, 3

Non-FRU Repairs		
FRU Description	Visual Inspection	Functional Checkout Procedures
No parts replaced	4, 5, 6, 7	1, 2, 3, *4, 5
Software update	n/a	1, 2, 3, *4, 5
Hardware upgrade	6, 7	1, 2, 3, *4, 5
Annual Electrical Safety Checkout	1, 3, 4, 5	1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 14, 13

Visual Inspection

Inspect the following for excessive wear and/or any visual signs of damage.

1. Check for defective or broken patient cable/leadwires and out-of-date electrodes.
   See "ECG Data Noise" on page 3-17 for more information.
2. Discuss electrode placement, skin prep, and patient-related requirements with the ECG technician.
   See Chapter 3, Preparing the Patient in the *MAC 800 Operator's Manual* for more information.
3. Verify the Keypad/LCD display filter passed inspection.
   See "Visual Inspection" on page 3-3 for more information.
4. Verify the AC power cord passed inspection.
   See "Visual Inspection" on page 3-3 for more information.
5. Verify the battery pack passed inspection.
   See "Visual Inspection" on page 3-3 for more information.
6. Verify that all harnesses and internal wiring have been secured.
   See "Visual Inspection" on page 3-3 for more information.
7. Verify the fasteners have been replaced and secured.
   See "Visual Inspection" on page 3-3 for more information.

Functional Checkout Procedures

Perform the functional checkout procedures that are applicable to the procedure that was performed.

Operational Checks

1. Verify the power-up self-test passed.
   See "Power-Up Self-Test" on page 3-2 for more information.
2. Verify the rhythm strip recorded successfully.
   See Chapter 5, "Recording a Resting ECG," in the *MAC™ 800 Operator's Manual*.
3. Verify the ECG recorded successfully.
   See Chapter 5, "Recording a Resting ECG," in the *MAC™ 800 Operator's Manual*.
4. Verify the ECG was stored successfully.
   See Chapter 8, "Managing Internal Storage," in the *MAC™ 800 Operator's Manual*.
5. Verify that simulated ECG data was transmitted successfully to a receiving product.
   See Chapter 8, "Managing Internal Storage," in the *MAC™ 800 Operator's Manual*.

Diagnostic Tests

6. Verify the display test was successful.
   See "Display Test" on page 3-7 for more information.
7. Verify the keyboard test was successful.
   See "Keyboard Test" on page 3-9 for more information.
8. Verify the writer test was successful.
   See "Writer Test" on page 3-11 for more information.
9. Verify the acquisition module test was successful.
   See "Acquisition Module Test" on page 3-10 for more information.
10. Verify the patient leadwire check was successful.
    See "Patient Lead Wire Test" on page 3-16 for more information.
11. Verify the battery test was successful.
    See "Battery Test" on page 3-11 for more information.
12. Verify the LAN test was successful.
    See "LAN Test" on page 3-14 for more information.
13. Verify the modem test was successful.
    See "Modem Test" on page 3-15 for more information.

Electrical Safety Checks

14. Verify the current leakage test results meet the requirements.
Perform electrical safety checks when indicated. All indicated electrical safety checks require a pass/fail indication for the steps performed. Record the measurement values in your debrief.

Electrical Safety Checks						
Step		Condition[1]	UUT - ON[2]	Result		Leakage Current Limits
	Earth Leakage Current					
1	Forward Polarity	NC	_____ μA	Pass/Fail		500 μA
2	Neutral Open, Forward Polarity	SFC	_____ μA	Pass/Fail		1,000 μA
3	Neutral Open, Reverse Polarity	SFC	_____ μA	Pass/Fail		1,000 μA
4	Reverse Polarity	NC	_____ μA	Pass/Fail		500 μA
	Enclosure Leakage Current					
1	Forward Polarity	NC	_____ μA	Pass/Fail		100 μA
2	Neutral Open, Forward Polarity	SFC	_____ μA	Pass/Fail		500 μA
3	Ground Open, Forward Polarity	SFC	_____ μA	Pass/Fail		500 μA
4	Ground Open, Reverse Polarity	SFC	_____ μA	Pass/Fail		500 μA
5	Neutral Open, Reverse Polarity	SFC	_____ μA	Pass/Fail		500 μA
6	Reverse Polarity	NC	_____ μA	Pass/Fail		100 μA
	Patient Leakage Current To Ground					
1	Forward Polarity	NC	_____ μA	Pass/Fail		10 μA
2	Neutral Open, Forward Polarity	SFC	_____ μA	Pass/Fail		50 μA
3	Ground Open, Forward Polarity	SFC	_____ μA	Pass/Fail		50 μA
4	Ground Open, Reverse Polarity	SFC	_____ μA	Pass/Fail		50 μA
5	Neutral Open, Reverse Polarity	SFC	_____ μA	Pass/Fail		50 μA
6	Reverse Polarity	NC	_____ μA	Pass/Fail		10 μA
	Ground Continuity					Resistance
1	Ac mains power cord ground prong to exposed metal surface (ground lug)	N/A	_____ Ω	Pass/Fail		Less than 200m Ω

1 NC = Normal Condition; SFC = Single Fault Condition; N/A = Not Applicable

2 UUT = Unit Under Test

Updating Software

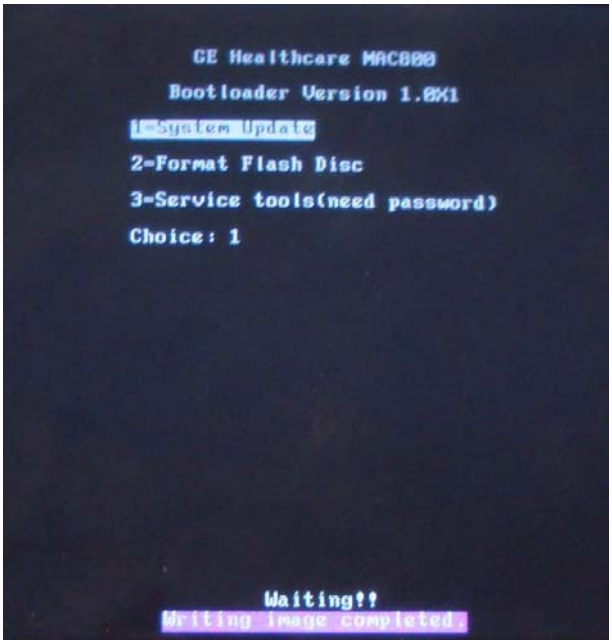
Software updates are provided on an SD card. Perform a software update as described in this section.

1. Insert the SD card with the software update (gold contacts down) in the SD card slot in the right side of the device, as shown.

2. Power up the system into boot loader by pressing the **F1** + **T9** + **Power** key at the same time, as shown.

3. Move the focus to *1=System Update* in the boot loader *Main Menu* and select by pressing *OK* to start the software update.

4. Boot loader will read the software from the SD card and write into Flash. Do not press any key until the *Writing image completed* message displays.



5. Press the **Power** key several seconds to shut down the system.
6. Press the **Power** key again to reboot the system.

   The system has been updated.

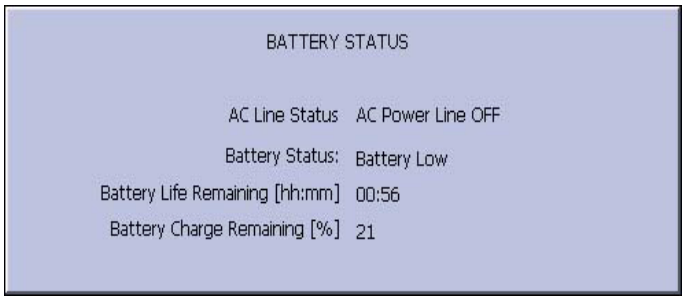
Conditioning the Battery Pack

To maintain the storage capacity of the battery pack installed in your MAC 800, GE Healthcare recommends that you condition your MAC 800 battery pack once every six months to reset the electronic fuel gauge inside the battery. A condition cycle consists of an uninterrupted “charge-discharge-charge” cycle.

You can condition the MAC 800 battery pack while installed in the MAC 800 system that is not being used to record tests on a patient.

1. Disconnect the AC mains power from the MAC 800 system.
2. Display the *Battery Status* window:
   a. From the *Main Menu*, press **F4** to select *System Configuration*.
   b. Press **F6** (*More*) > **F6** (*More*) > **F5** (*Service Setup*).
   c. Type the service password and press **F6** (*OK*).
   d. Select the *System Diagnostics* button.
   e. Select the *Battery Test* button.

      The *Battery Status* window opens.



3. Allow the battery to discharge until the *Battery Charge Remaining* [%] is less than 5%.
4. Turn off the unit and reconnect the AC mains power.
5. Allow the battery to fully charge.

   NOTE
   The amber Battery LED indicator will light while the unit is charging and turn off when charging is complete.

6. Remove the AC mains power and turn on the MAC 800 unit.
7. Leave the unit on and allow the battery to discharge until the MAC 800 system shuts off.
8. Reconnect the AC mains power to the MAC 800, leaving the unit turned off, and allow the battery to fully recharge.

   When the amber Battery LED indicator turns off, the battery is fully charged. The conditioning cycle is complete.

5 Parts Lists

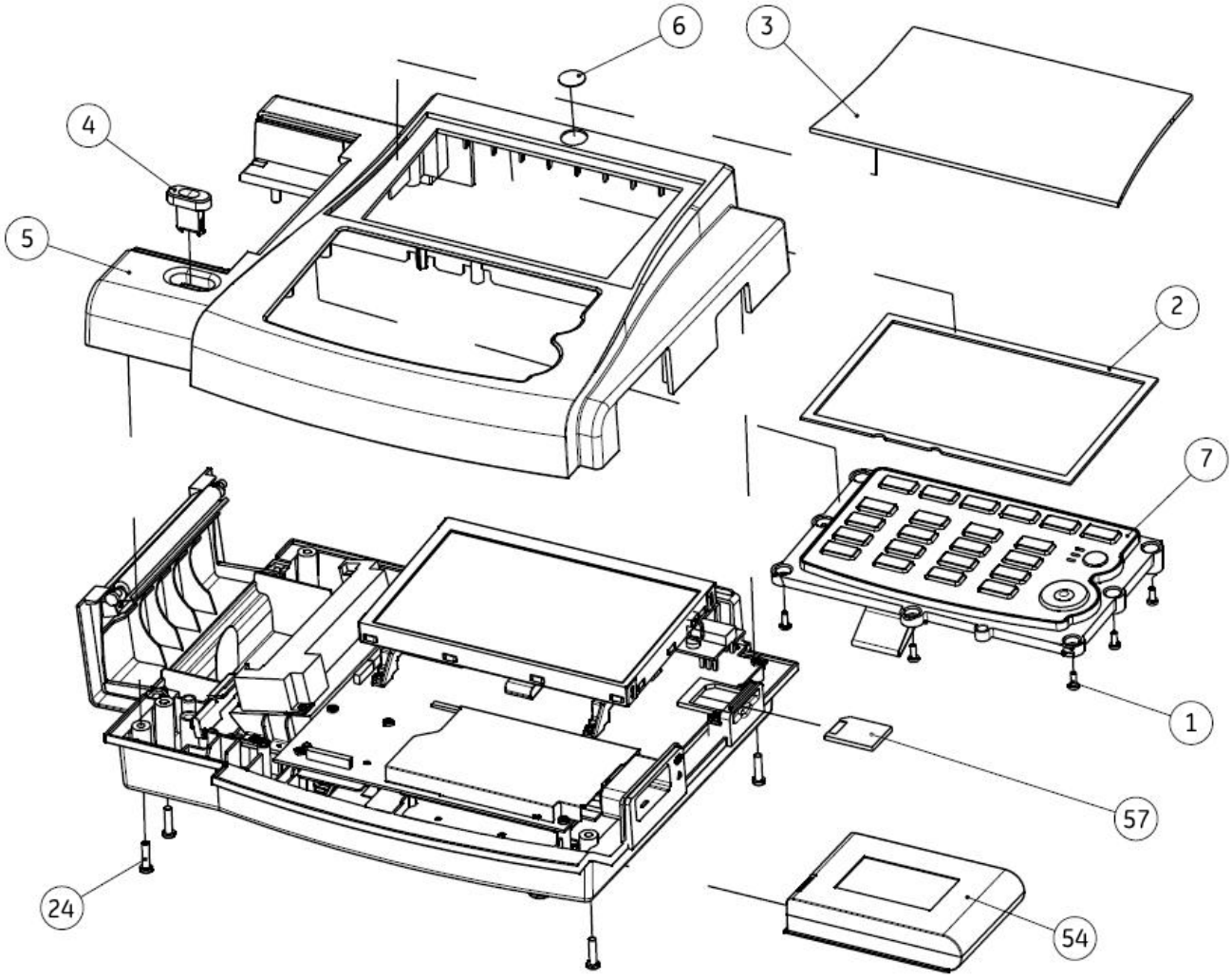
Ordering Parts

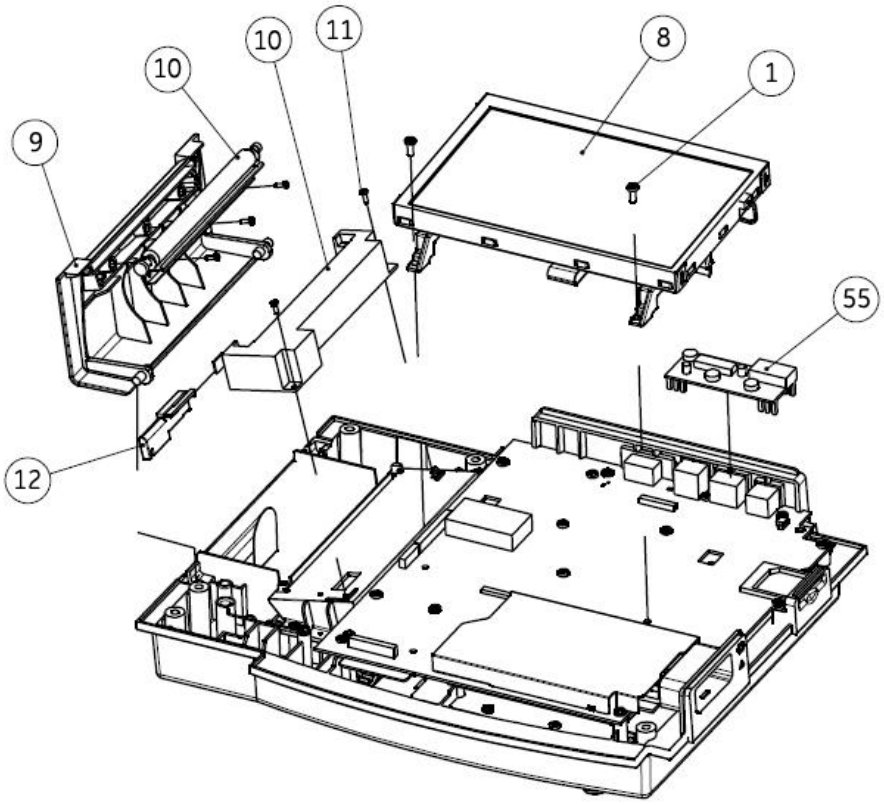
The FRU parts lists in this chapter supply enough detail for you to order parts for the assemblies, stand-alone FRUs, and FRU kits considered field serviceable. Only items, assemblies, and kits which have part numbers given in this chapter are available for purchase as FRUs. To order parts, contact GE Healthcare Service Parts.

Field Replaceable Units (FRUs)

MAC 800 Upper Level Assembly Diagrams

The following diagrams identify the field replaceable units of the MAC 800 system. The numbers in the callouts reference part descriptions found in “MAC 800 Upper Level Assembly Part List” on page 5-9.

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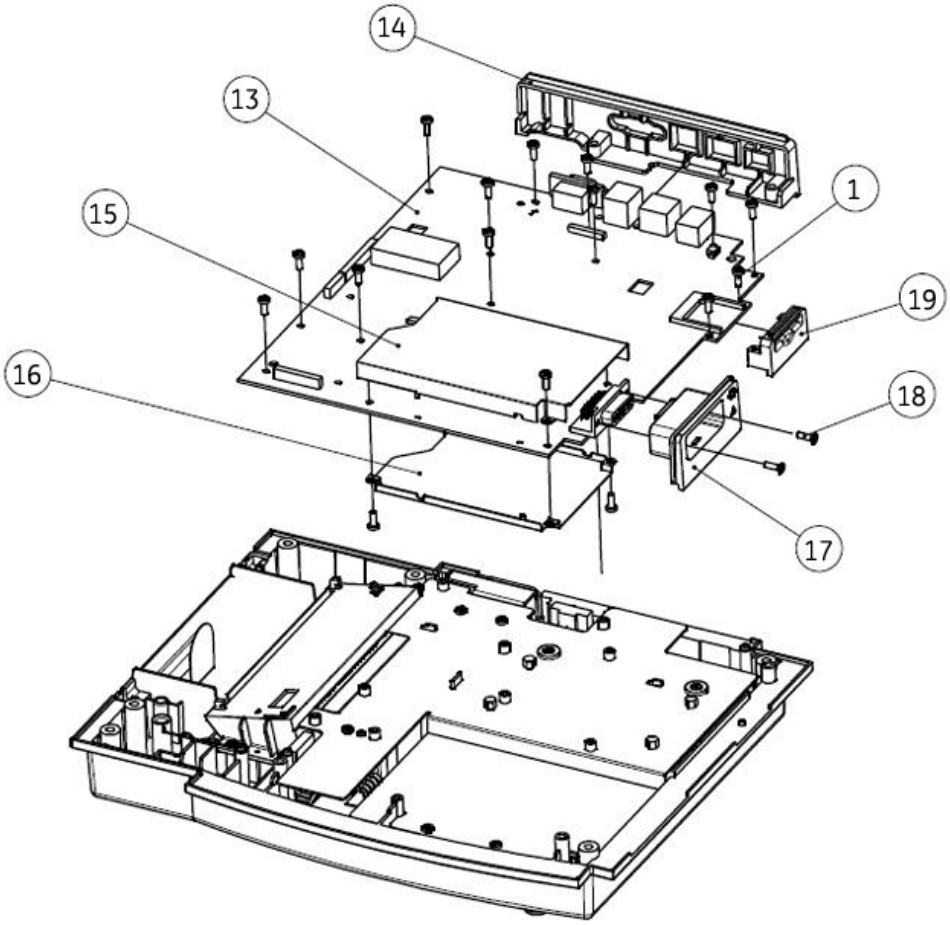
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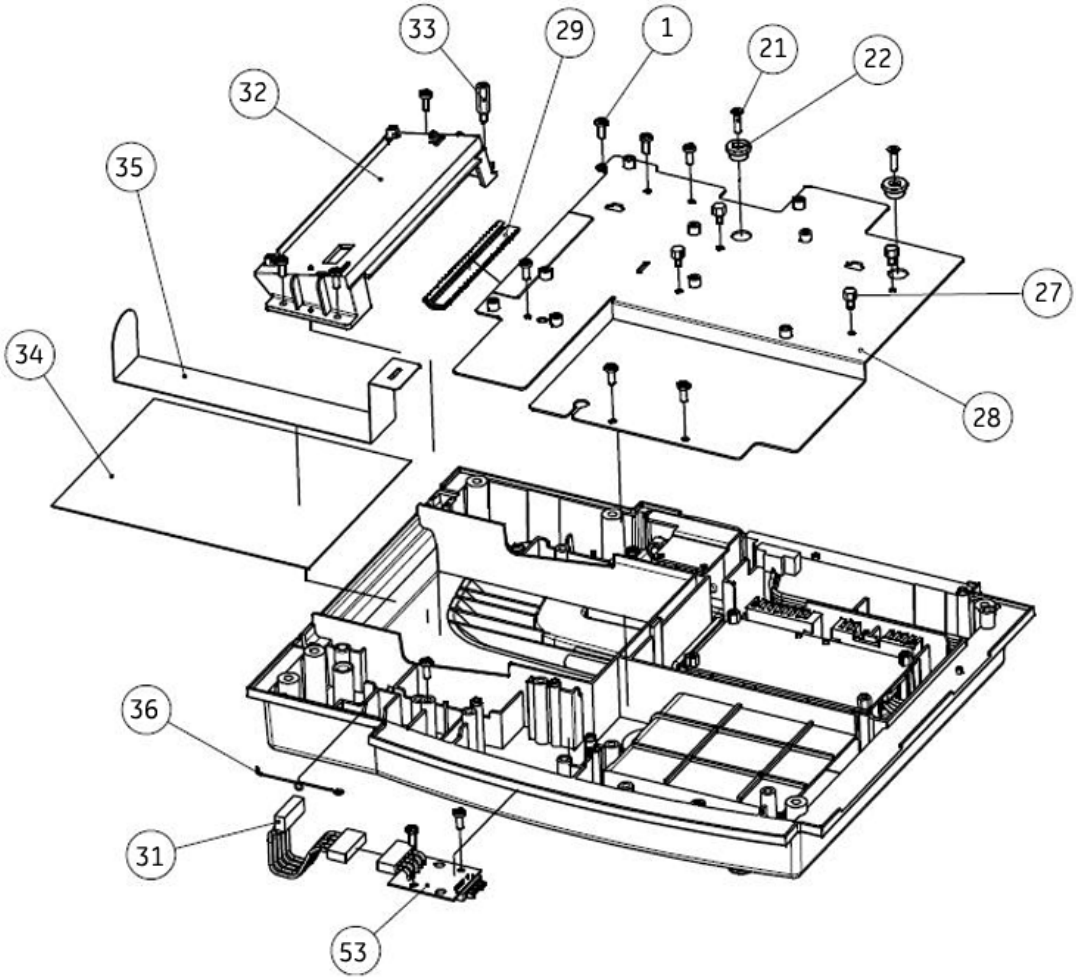
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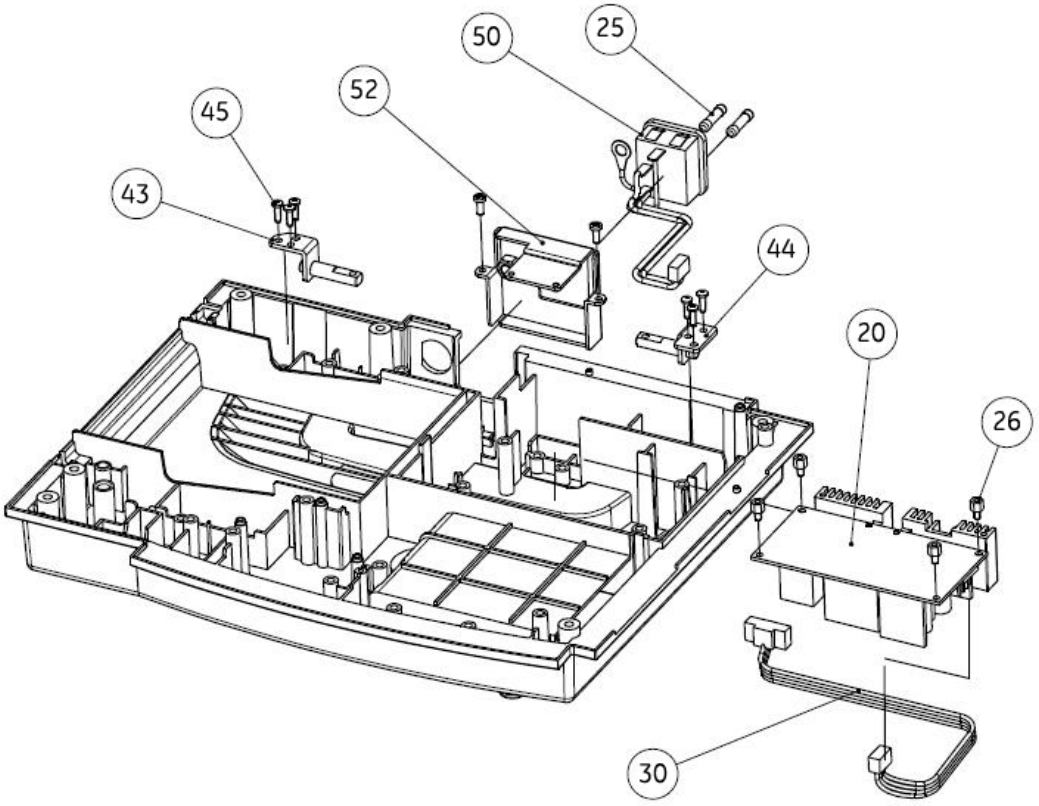
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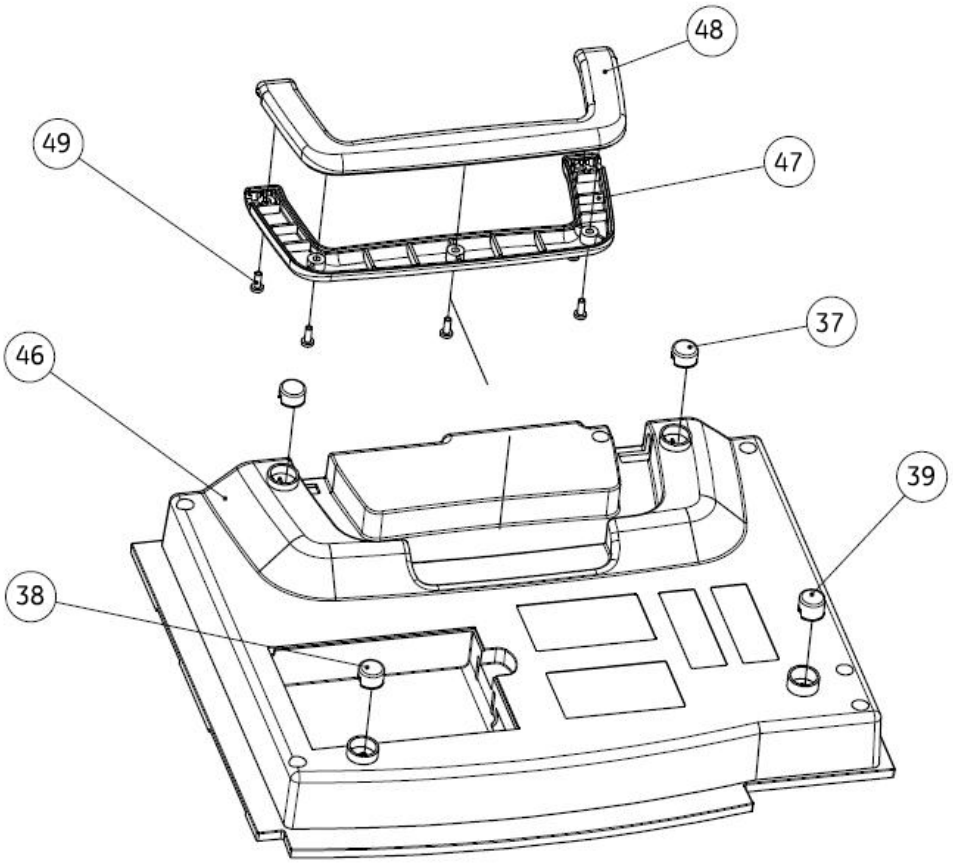
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MAC 800 Upper Level Assembly Part List

The following table identifies the parts available for the MAC 800 system.

The numbers in the Item column refer to the callouts from the diagrams found in "MAC 800 Upper Level Assembly Diagrams" on page 5-3.

The numbers in the Part Number column identify the GE Healthcare part number for orderable parts. Items without part numbers cannot be purchased independently of a FRU kit.

800 Upper Level Assembly		
Item	Part Number	Item Description
1		M3X8 MACHINE SCREW PHILIPS PAN NI Included with: ■ "FRU Mainboard Assembly, PN 2039942-001" on page 5-14 ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
2		LCD POLY FOAM Included with "FRU Top Cover Assembly, PN 2039939-001" on page 5-13
3		LCD LENS Included with "FRU Top Cover Assembly, PN 2039939-001" on page 5-13
4		PRINTER BUTTON Included with "FRU Top Cover Assembly, PN 2039939-001" on page 5-13
5		TOP COVER Included with "FRU Top Cover Assembly, PN 2039939-001" on page 5-13
6		NAMEPLATE 15MM GE LOGO Included with "FRU Top Cover Assembly, PN 2039939-001" on page 5-13
7		KEYPAD See "Keypads" on page 5-18
8	2039940-001	MAC800 FRU LCD ASSEMBLY
9		PRINTER DOOR Included in "FRU Printer Assembly, PN 2039941-001" on page 5-13
10		THERMAL PRINTER HEAD - MAC800 Included with "FRU Printer Assembly, PN 2039941-001" on page 5-13
11		M2X6 MACHINE SCREW PHILIPS PAN Included with: ■ "FRU Printer Assembly, PN 2039941-001" on page 5-13 ■ "FRU Kits, PN 2039945-001" on page 5-20
12		PRINTER HOLDER Included with "FRU Printer Assembly, PN 2039941-001" on page 5-13

800 Upper Level Assembly (Continued)		
Item	Part Number	Item Description
13		PCB MAC800 MAINBOARD Included with "FRU Mainboard Assembly, PN 2039942-001" on page 5-14
14		REAR PANEL Included with "FRU Mainboard Assembly, PN 2039942-001" on page 5-14
15		ACQ COVER1 Included with "FRU Mainboard Assembly, PN 2039942-001" on page 5-14
16		ACQ COVER2 Included with "FRU Mainboard Assembly, PN 2039942-001" on page 5-14
17		PATIENT CABLE CONNECTOR HOLDER Included with "FRU Mainboard Assembly, PN 2039942-001" on page 5-14
18		AN00388 4-40x3/8 SCREW NI Included with: ■ "FRU Mainboard Assembly, PN 2039942-001" on page 5-14 ■ "FRU Kits, PN 2039945-001" on page 5-20
19		SD CARD HOUSE Included with "FRU Mainboard Assembly, PN 2039942-001" on page 5-14
20		60W 12V OUTPUT AC-DC MODULE BIG HEATSINK Included with "FRU Power Supply Assembly, PN 2040052-001" on page 5-14
21		FLAT SCREW M3X12 Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
22		CRIMP RING .217 Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
24		M4X16 MACHINE SCREW PHILIPS PAN NI Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
25	2039946-001	FUSE 2.0A QUI-BLO 250V 5X20MM Available as an independent FRU. Also included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15.
26		HEXAGON SCREW1 Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20

800 Upper Level Assembly (Continued)		
Item	Part Number	Item Description
27		HEXAGON SCREW2 Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
28		SHIELD PLATE Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
29		CLIP-ON SHIELD COVER Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
30		CABLE FOR MAINBOARD Included with: ■ "FRU Power Supply Assembly, PN 2040052-001" on page 5-14 ■ "FRU Kits, PN 2039945-001" on page 5-20
31		CABLE FOR BATTERY Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
32		PRINTER MOUNTING BASE Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
33		PRINTER GROUND POLE Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
34		PAPER TRAY SHEET Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
35		PAPER LIFTING TAPE Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
36		PRINTER SPRING Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
37		FOOTPAD1 Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
38		FOOTPAD2 Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20

800 Upper Level Assembly (Continued)		
Item	Part Number	Item Description
39		FOOTPAD3 Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
43		HINGE LEFT Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
44		HINGE RIGHT Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
45		ST2 9X9.5 SELF TAPPING SCREW NI Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
46		BOTTOM COVER Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
47		HANDLE BOTTOM Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
48		HANDLE TOP Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
49		M3X10 MACHINE SCREW PHILIPS PAN NI Included with: ■ "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15 ■ "FRU Kits, PN 2039945-001" on page 5-20
50		AC INLET MODULE Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
52		AC INLET HOUSE MODULE Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
53		PCB MAC800 BATTERY INTERFACE BD Included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 5-15
54	2039944-001	MAC800 FRU BATTERY ASSEMBLY
55	2039947-001	MAC800 FRU INTERNAL MODEM (OPTION)
57	202768-004	CARD SECURE DIGITAL 512MB
58	2040058-001	MAC800 FRU CD & MANUAL
59	2040760-001	FRU MAC800 PROGRAMMED SD CARD

FRU Top Cover Assembly, PN 2039939-001

The following table summarizes the items in the FRU Top Cover Assembly. Item numbers correspond to the item numbers in the MAC 800 Upper Level Assembly Diagrams beginning on page 5-3.

FRU Top Cover Assembly, PN 2039939-001		
Item	Description	Qty
2	LCD POLY FOAM	1
3	LCD LENS	1
4	PRINTER BUTTON	1
5	TOP COVER	1
6	NAMEPLATE 15MM GE LOGO	1

FRU Printer Assembly, PN 2039941-001

The following table summarizes the items in the FRU Printer Assembly. Item numbers correspond to the item numbers in the "MAC 800 Upper Level Assembly Diagrams" on page 5-3.

FRU Printer Assembly, PN 2039941-001		
Item	Description	Qty
9	PRINTER DOOR	1
10	THERMAL PRINTER HEAD-MAC800	1
11	M2X6 MACHINE SCREW PHILIPS PAN	3
12	PRINTER HOLDER	1

FRU Mainboard Assembly, PN 2039942-001

The following table summarizes the items in the FRU Mainboard Assembly. Item numbers correspond to the item numbers in the "MAC 800 Upper Level Assembly Diagrams" on page 5-3.

FRU Mainboard Assembly, PN 2039942-001		
Item	Description	Qty
1	M3X8 MACHINE SCREW PHILIPS PAN NI	7
13	PCB MAC800 MAINBOARD	1
14	REAR PANEL	1
15	ACQ COVER1	1
16	ACQ COVER2	1
17	PATIENT CABLE CONNECTOR HOLDER	1
18	AN00388 4-40x3/8 SCREW NI	2
19	SD CARD HOUSE	1

FRU Power Supply Assembly, PN 2040052-001

The following table summarizes the items in the FRU Power Supply Assembly. Item numbers correspond to the item numbers in the "MAC 800 Upper Level Assembly Diagrams" on page 5-3.

FRU Power Supply Assembly, PN 2040052-001		
Item	Description	Qty
20	60W 12V OUTPUT AC-DC MODULE BIG HEATSINK	1
30	CABLE FOR MAIN BOARD	1

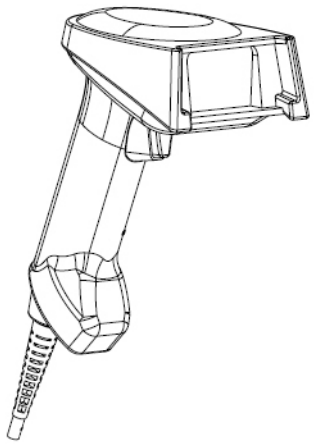
FRU Bottom Cover Assembly, PN 2039943-001

The following table summarizes the items in the FRU Bottom Cover Assembly. Item numbers correspond to the item numbers in the "MAC 800 Upper Level Assembly Diagrams" on page 5-3.

FRU Bottom Cover Assembly, PN 2039943-001		
Item	Description	Qty
1	M3X8 MACHINE SCREW PHILIPS PAN NI	17
21	FLAT SCREW M3X12	2
22	CRIMP RING .217	2
24	M4X16 MACHINE SCREW PHILIPS PAN NI	6
25	FUSE 2.0A QUI-BLO 250V 5X20MM	2
26	HEXAGON SCREW1	4
27	HEXAGON SCREW2	4
28	SHIELD PLATE	1
29	CLIP-ON FOR SHIELD COVER	1
31	CABLE FOR BATTERY	1
32	PRINTER MOUNTING BASE	1
33	PRINTER GROUND POLE	1
34	PAPER TRAY SHEET	1
35	PAPER LIFTING TAPE	1
36	PRINTER SPRING	1
37	FOOTPAD1	2
38	FOOTPAD2	1
39	FOOTPAD3	1
43	HINGE LEFT	1
44	HINGE RIGHT	1
45	ST2.9X9.5 SELF TAPPING SCREW NI	6
46	BOTTOM COVER	1
47	HANDLE BOTTOM	1
48	HANDLE TOP	1
49	M3X10 MACHINE SCREW PHILIPS PAN NI	2

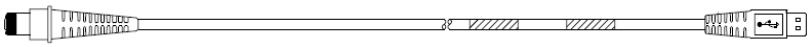
FRU Bottom Cover Assembly, PN 2039943-001 (Continued)		
Item	Description	Qty
50	AC INLET MODULE	1
52	AC INLET HOUSE MODULE	1
53	PCB MAC800 BATTERY INTERFACE BD	1

Model Data Matrix Barcode Scanner Kits



MAC 800 Data Matrix Barcode Scanner Kits	
Part Number	Description
2041391-001	MAC 800 FRU USB BARCODE SCANNER ENG
2041391-002	MAC 800 FRU USB BARCODE SCANNER GER
2041391-003	MAC 800 FRU USB BARCODE SCANNER FRE
2041391-004	MAC 800 FRU USB BARCODE SCANNER SPA
2041391-005	MAC 800 FRU USB BARCODE SCANNER SWE
2041391-006	MAC 800 FRU USB BARCODE SCANNER ITA
2041391-007	MAC 800 FRU USB BARCODE SCANNER JAP
2041391-008	MAC 800 FRU USB BARCODE SCANNER DUT
2041391-009	MAC 800 FRU USB BARCODE SCANNER NOR
2041391-010	MAC 800 FRU USB BARCODE SCANNER DAN
2041391-011	MAC 800 FRU USB BARCODE SCANNER CZE

MAC 800 Data Matrix Barcode Scanner Kits (Continued)	
Part Number	Description
2041391-013	MAC 800 FRU USB BARCODE SCANNER CHN
2041391-014	MAC 800 FRU USB BARCODE SCANNER HUN
2041391-015	MAC 800 FRU USB BARCODE SCANNER POL
2041391-016	MAC 800 FRU USB BARCODE SCANNER RUS
2041391-017	MAC 800 FRU USB BARCODE SCANNER SLO
2041391-018	MAC 800 FRU USB BARCODE SCANNER POR
2041391-019	MAC 800 FRU USB BARCODE SCANNER KOR
2041391-020	MAC 800 FRU USB BARCODE SCANNER FIN



MAC 800 Data Matrix Barcode Scanner Cable	
Part Number	Description
2041393-001 [1]	MAC800 FRU CABLE USB BARCODE SCANNER

[1] Cable is included in barcode scanner kits. Order this part number if only the cable is required.

Keypads

MAC 800 Keypad Assemblies	
Part Number	Description
2040049-001	MAC800 FRU KEYPAD ASSEMBLY ENGLISH
2040049-002	MAC800 FRU KEYPAD ASSEMBLY RUSSIAN

NOTE

The Russian Keypad (2040049-002) is used only in Russia; all other countries use the English Keypad (2040049-001).

Power Cords

MAC 800 Power Cords	
Part Number	Description
405535-006	PWR SPLY CRD RA HOSP GRD 10A 125V 10FT
401855-101	PWR SPLY CRD ST CONT EURO 10A 250V 2.5M
401855-102	PWR SPLY CRD ST BRITSH 10A 250V 2.5M FSD
401855-103	PWR SPLY CRD ST ITALIAN 10A 250V 2.5M
401855-110	PWR SPLY CRD ST AUSTRALIAN 10A 250V 2.5M
401855-104	PWR SPLY CRD ST ISRAELI 10A 250V 2.5M
401855-107	PWR SPLY CRD ST SWISS 10A 250V 2.5M
401855-108	PWR SPLY CRD ST INDIAN 10A 250V 2.5M
401855-018	PWR CRD ST CHINA RA PLUG 10A 250V 2.5M
405535-011	PWR SPLY CRD ST-RA PSE 10A 250V 10FTROHS

Serial Cable

MAC 800 Serial Cable	
Part Number	Description
2041488-001	MAC800 FRU SERIAL CABLE

FRU Kits, PN 2039945-001

FRU Kits, PN 2039945-001		
Item	Description	Qty
1	M3X8 MACHINE SCREW PHILIPS PAN NI	20
11	M2X6 MACHINE SCREW PHILIPS PAN	5
18	AN00388 4-40X3/8 SCREW NI	2
21	FLAT SCREW M3X12	2
22	CRIMP RING .217	2
24	M4X16 MACHINE SCREW PHILIPS PAN NI	6
26	HEXAGON SCREW1	4
27	HEXAGON SCREW2	4
30	CABLE FOR MAIN BOARD	1
31	CABLE FOR BATTERY	1
34	PAPER TRAY SHEET	1
35	PAPER LIFTING TAPE	1
36	PRINTER SPRING	1
37	FOOTPAD1	2
38	FOOTPAD2	1
39	FOOTPAD3	1
45	ST2.9X9.5 SELF TAPPING SCREW NI	6
49	M3X10 MACHINE SCREW PHILIPS PAN NI	2

A Technical Specifications

Features and Functions

Features and Functions	
Acquisition & Analysis	■ Analog acquisition module ■ Marquette 12SL interpretation ■ Marquette 12SL Hook-up Advisor ■ 4.88 micro V resolution
Processing	■ 12 lead simultaneous analysis ■ 1000 samples/sec ■ 500 samples/sec
Display	■ 7” diagonal viewing display, 16:9 aspect ratio ■ 800 x 480 pixels ■ Color
Memory	■ Internal 100 ECG (option) ■ Internal 300 ECG (option)
Printer	■ 114mm thermal array print head ■ Resolution: Vertically 200 dots/ 25mm, horizontally 1000 dots/ 25mm @25mm/sec ■ Paper type: Z-fold Thermal paper ■ Writer speed: 5, 25, 50 mm/sec
Connectivity	■ Secure Digital card ■ Serial port (option) ■ Internal modem (option) ■ Support for USB barcode (GE-supported) (option) ■ Transmit acquired ECG to MUSE system (option) ■ Transmit acquired ECG to CardioSoft system (option) ■ LAN (transmission to GE ECG management System) (option)
Keyboard	Telephone Keypad
Application Options	■ RR Analysis ■ Export XML to PDF ■ Pharma package ~ 21 CFR part 11 audit tool and CT Data Guard

Features and Functions	
Languages	■ English ■ German ■ French ■ Italian ■ Spanish ■ Portuguese (Brazilian Portuguese) ■ Hungarian ■ Polish ■ Czech ■ Slovak ■ Simplified Chinese ■ Russian ■ Korean ■ Japanese ■ Finnish ■ Swedish ■ Dutch ■ Norwegian ■ Danish

Specifications

Specifications	
Height / width/ depth	120mm x 330 mm x 280mm (approximately)
Weight	Approximately 3 kg w/ battery installed. w/o print paper
Power Supply	AC operation ■ Voltage: 100-240 VAC, +10% ■ Current: 0.5A at 115 VAC, 0.3A at 240 VAC ■ Frequency: 50Hz/60 Hz, ±3Hz
	Battery operation ■ Type: User replaceable, 7.2V@ 4.5 AH ±10%, rechargeable Lithium Ion ■ Capacity: 1000 single page reports or 2 hours continuous display (without printing) ■ Charge time Approximately 4 hours from total discharge (with display off)
Temperature	Operating temperature: +5°C to +40°C / +41°F to +104°F Storage temperature: -30°C to +60°C / -22°F to +140°F
Relative Humidity	Operating Humidity: 25% to 95% (non-condensing) Storage Humidity: 10% to 95% (non-condensing)

Specifications	
Pressure	Operating Pressure: 700 hPa to 1060 hPa Storage Pressure: 500 hPa to 1060 hPa
Warranty	1 year
Certifications	■ IEC 60601-1: 1988 +Amd-1: 1991 +Amd-2: 1995 General Requirements for Safety ■ IEC 60601-1-1: 2000 Medical Electrical Equipment: General Requirements for Safety ■ IEC 60601-1-2: 2001/2004 General Requirements for Safety Electromagnetic Compatibility ■ IEC 60601-1-4:2000 General Requirements for Collateral Standard: Programmable Electrical Medical Systems ■ IEC 60601-1-6:2006 General Requirements for Safety: Usability ■ IEC 60601-2-25: 1993 +Amd-1: 1999 Safety of Electrocardiographs ■ IEC 60601-2-51: 2003 Safety and performance of ECG recorders ■ EN 55011:2007/A2:2007 Industrial, scientific and medical (ISM) radio-frequency Equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement. ■ AAMI EC11: 1991/(R)2001/(R)2007 Diagnostic Electrocardiographic Devices ■ ANSI/AAMI EC13:2002 Cardiac Monitors, Heart Rate Meters, and Alarms (Onscreen heart rate meter, claus 4.2.7 only) ■ ANSI/AAMI EC57:1998/(R)2003 Testing and Reporting Performance Results of Cardiac Rhythm and ST-segment Measurement Algorithms (All classes except 4.3.3.2, 4.3.3.3, and 4.6.) ■ UL 60601-1:2003 Medical Electrical Equipment, part 1: General Requirements for Safety ■ CAN/USA C22.2 No. 601.1 ■ GB 9706.1-1995 Medical Electrical Equipment - Part 2: Particular requirements for the safety of electrocardiographs ■ GB 10793-2000 Medical Electrical Equipment - Part 2: Particular requirements for the safety of electrocardiographs ■ YY1139-2000 Single and multichannel electrocardiograph.

Classification

Type of protection against electrical shock	Class I, internally powered equipment
Degree of protection against electrical shock	Type CF defibrillation-proof applied part
Degree of protection against harmful ingress of water	Ordinary Equipment (enclosed equipment without protection against ingress of water).
Degree of safety of application in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide	Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide
Method(s) of sterilization or disinfection recommended by the manufacturer	Not applicable
Mode of operation	Continuous operation

B Electromagnetic Compatibility

Electromagnetic Compatibility (EMC) Overview

Changes or modification to this system not expressly approved by GE Healthcare could cause EMC issues with this or other equipment. This system is designed and tested to comply with applicable regulation(s) regarding EMC and needs to be installed and put into service according to the EMC information stated as follows.

WARNING
INTERFERENCE — Use of portable phones or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation.

WARNING
PLACEMENT — The equipment or system should not be used adjacent to, or stacked with, other equipment.

If adjacent or stacked use is necessary, the equipment or system should be tested to verify normal operation in the configuration in which it is being used.

Guidance and Manufacturer's Declaration - Electromagnetic Emissions

The MAC 800 is intended for use in the electromagnetic environment specified below. It is the responsibility of the customer or user to ensure that the MAC 800 system is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment - Guidance
RF Emissions CISPR11	Group 1	The equipment uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR11	Class B	Class B Equipment is suitable for use in all establishments including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	Class B	
Voltage Fluctuations Flicker Emissions IEC 61000-3-3	Complies	

Guidance and Manufacturer's Declaration - Electromagnetic Immunity

The MAC 800 system is intended for use in the electromagnetic environment specified in the following table. It is the responsibility of the customer or user to ensure that the MAC 800 system is used in such an environment.

Immunity Test	EN 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	■ ± 6 kV contact ■ ± 8 kV air	■ ± 6 kV contact ■ ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines	± 2 kV for power supply lines	Mains power should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	■ ± 1 kV differential mode ■ ± 2 kV common mode	■ ± 1 kV differential mode ■ ± 2 kV common mode	Mains power should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	■ <5% *Ut* (>95% dip in *Ut*) for 0.5 cycles ■ 40% *Ut* (60% dip in *Ut*) for 5 cycles ■ 70% *Ut* (30% dip in *Ut*) for 25 cycles ■ <5% *Ut* (>95% dip in *Ut*) for 5 sec	■ <5% Ut (>95% dip in Ut) for 0.5 cycles ■ 40% Ut (60% dip in Ut) for 5 cycles ■ 70% Ut (30% dip in Ut) for 25 cycles ■ <5% Ut (>95% dip in Ut) for 5 sec	Mains power should be that of a typical commercial or hospital environment. If the user of the MAC 800 requires continued operation during power mains interruptions, it is recommended that the MAC 800 be powered from an uninterruptible power supply or a battery.
Power frequency 50/ 60 Hz) magnetic field EC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristics of a typical location in a typical commercial or hospital environment.

NOTE

Ut is the AC mains voltage prior to application of the test level.

Guidance and Manufacturer's Declaration - Electromagnetic Immunity

The MAC 800 is intended for use in the electromagnetic environment specified in the following table. It is the responsibility of the customer or user to assure that the MAC 800 is used in such an environment.

Immunity Test	EN 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
			Portable and mobile RF communications equipment should not be used closer to any part of the equipment, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance
Conducted RF IEC 61000-4-6	3 Vrms 150 KHz to 80 MHz	3 Vrms	$d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 Vrms 80 MHz to 2.5 GHz	3 Vrms	$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer, and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey a, should be less than the compliance level in each frequency range b. Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1:At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2:These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.
a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the equipment is used exceeds the applicable RF compliance level above, the equipment should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the equipment.
b Over the frequency range 150 KHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended Separation Distances

The following table provides the recommended separation distances (in meters) between portable and mobile RF communication equipment and the MAC 800 system.

The MAC 800 system is intended for use in the electromagnetic environment on which radiated RF disturbances are controlled. The customer or the user of the MAC 800 system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the MAC 800 system as recommended below,

according to the maximum output power of the communications equipment.

	Separation Distance in Meters (m) According to Frequency of Transmitter			
Rated Maximum Output Power of Transmitter in Watts	150 kHz to 80 MHz outside ISM bands $d = 1.2\sqrt{P}$	150 kHz to 80 MHz in ISM bands $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.12	0.23
0.1	0.38	0.38	0.38	0.73
1	1.2	1.2	1.2	2.3
10	3.8	3.8	3.8	7.3
100	12	12	12	23
NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.				

For transmitters rated at a maximum output power not listed above, the recommended separation distance [d] in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (w) according to the transmitter manufacturer.

NOTE

These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

EMC-Compliant Cables and Accessories

WARNING

USE OF CORRECT ACCESSORIES — The use of accessories, transducers and cables other than those specified may result in increased emissions or decreased immunity performance of the equipment or system.

The following table lists cables, transducers, and other applicable accessories which GE Healthcare claims are EMC compliant.

NOTE

Any supplied accessories that do not affect EMC compliance are not included.

Compliant Cables and Accessories	
Part Number	**Description**
2029890-001	Value ECG Cable/Leadwires, IEC
2029893-001	Value ECG Cable/Leadwires, AHA
2014041-001	KIT LEADWIRE MAC1200
2014041-002	KIT LEADWIRE MAC3500 IEC
2005836-006	MAC 1100/1200 NEHB PTO OC
2005836-008	KISS10/12 PTO OC
405535-006	PWR SPLY CRD RA HOSP GRD 13A 125V 10FT
401855-101	PWR SPLY CRD ST CONT EURO 10A 250V 2.5M
401855-102	PWR SPLY CRD ST BRITSH 10A 250V 2.5M FSD
401855-103	PWR SPLY CRD ST ITALIAN 10A 250V 2.5M
401855-110	PWR SPLY CRD ST AUSTRALIAN 10A 250V 2.5M
401855-104	PWR SPLY CRD ST ISRAELI 10A 250V 2.5M
401855-107	PWR SPLY CRD ST SWISS 10A 250V 2.5M
401855-108	PWR SPLY CRD ST INDIAN 10A 250V 2.5M
401855-018	PWR CRD ST CHINA RA PLUG 10A 250V 2.5M
405535-011	PWR SPLY CRD ST-RA PSE 10A 250V 10FTROHS
2040758-001	USB BARCODE SCANNER WITH MAGNET RING ENG
2037082-001	MAC 800 BATERY ASSEMBLY
2040494-001	MAC800 SERIAL CABLE FEMALE TO MALE 1.83M
2038704-001	MODEM SOCKET MT9234SMI V.92

C Supplies & Accessories

Introduction

This section of the manual lists the supplies and accessories that are supported by the MAC 800 system and are recommended for use by GE Healthcare.

Standard Accessories

Part Number	Description
22341808	Patient trunk cable, 10-lead IEC
22341809	Patient trunk cable, 10-lead AHA
21708318	Electrode Cream, one 250g bottle
420101-002	CAM14 Universal Leadwire Set, Mixed length, 10/set
900178-001	KIT ADAPTER 10 SET AHA BANANA
900178-101	KIT ADAPTER 10 SET BANANA IEC
9490-210	CLIP UNIVERSAL GE 10/PKG
9623-003P	SILVER MACTRODE PLUS 1000/CASE

Value Accessories

Part Number	Description
2029890-001	Value 10LD Patient Cable/Ldwr, IEC
2029893-001	Value 10LD Patient Cable/Ldwr, AHA
2029891-001	Value Reusable Limb Clamps, IEC, 4/set
2029894-001	Value Reusable Limb Clamps, AHA, 4/set
2029892-001	Value Reusable Bulb Electrodes, 6/set

Thermal Papers

Part Number	Description
2036970-001	Z-FOLD PAPER-110MM WIDTH-MAC800

Serial Cable

Part Number	Description
2040494-001	MAC800 SERIAL CABLE FEMALE TO MALE 1.83M

Country-Specific Power Cords

Part Number	Description
401855-101	PWR SPLY CRD ST CONT EURO 10A 250V 2.5M
401855-102	PWR SPLY CRD ST BRITSH 10A 250V 2.5M FSD
401855-103	PWR SPLY CRD ST ITALIAN 10A 250V 2.5M
401855-110	PWR SPLY CRD ST AUSTRALIAN 10A 250V 2.5M
401855-104	PWR SPLY CRD ST ISRAELI 10A 250V 2.5M
401855-107	PWR SPLY CRD ST SWISS 10A 250V 2.5M
401855-108	PWR SPLY CRD ST INDIAN 10A 250V 2.5M
401855-018	PWR CRD ST CHINA RA PLUG 10A 250V 2.5M
405535-006	PWR SPLY CRD RA HOSP GRD 10A 125V 10FT
405535-011	PWR SPLY CRD ST-RA PSE 10A 250V 10FTROHS

Optional Accessories

Part Number	Description
21612413	SUCTION SYSTEM KISS 10-LEAD MSMART W/PMP
2005836-006	NEHB Leadwire

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